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Late Toxemias of Pregnancy; the Number One Obstetrical Problem of the South

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THE problem of the "ill-fed," "ill-clothed," and "ill-housed" is not new in the South; nor is the menace of the toxemias of pregnancy. That these apparently diverse statements are related and pertinent is not too difficult to demonstrate.

Even though the mentally and financially able people of the South were motivated only by the most selfish instincts, they would realize the necessity of preserving the health and competency of this class. It is well recognized that these thirteen million persons are the greatest and probably the last source of man-power reserve. As a matter of fact, the thoroughly altruistic capable leaders have since Colonial days taken a genuine and helpful interest in these people. This has continued and progressed even through the devastation and misery of the Civil War. The enlightened class had not only to strive to survive themselves, but also to carry the less fortunate through all kinds of political, sociologic, and especially economic discrimination. The resulting rancor and bitterness are still manifest in the more stupid class of white people. To repeat the triad of "ills" is familiar.

McCord in scholarly fashion has called attention to the high maternal mortality and the social problems which confront the Negro and the large group of usually impoverished white population. In a recent study, Williams has shown that race per se should not be an altering factor.

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The gradual progress and enlightenment must be viewed with mixed emotions until the process is complete. Already we know that criminal abortions and homosexuality are increasing in the Negro. The latter is a disturbing moral and mental factor in any group, and the former is bound to be an exacting factor in a people improperly nourished and already prone to infection. The stoicism, naturally happy and misunderstood disposition and zeal for life, give a false sense of well-being. Malnutrition, infection, anemia, tendency to cardiovascular disease, and environment are the more pertinent factors. The Negro and undernourished actually belie the generally accredited ability to "take it" obstetrically and surgically. We believe that once these women are admitted to a recognized hospital their treatment is comparable in competency to that of other localities. Certainly in our institution the house staff soon learns that the pathology and chance for learning are in this class patient, and the "private" patient is passed over in a zeal to stand by the patient with "real pathology." Bradford has insisted that the rural patient cannot be compared on a fair basis with her urban sister. The only consistent factors are poverty and sickness, and McCord has wisely said that uniformly good obstetrics cannot be given these women, when such care is measured in terms of professional service alone.

One has only to study the medical bibliography of this section to know that its obstetricians are cognizant of the problem of the late toxemia of pregnancy. It is unnecessary to mention the authors and their contributions.

The maternal mortality tables show that our section is usually in the higher third, and a review of the "cause of death" is indicative. The figures in North Carolina parallel those of the South Atlantic region. From tables published at about the time our studies begin we find:

NEW YORK CITY
COMMONWEALTH FUND

17.5%
25.0%
9.7%
12.0%

Abortion
Sepsis
Hemorrhage
Toxemia

NORTH CAROLINA
BOARD OF HEALTH

11%
15%
10%
41%

In 1933 Hamilton made a state survey, and his figures are given in comparison with Kosmak's.

NEW YORK STATE—1,832
285 DEATHS

30%
24%
23%

Sepsis
Hemorrhage
Toxemia

NORTH CAROLINA—1,933
268 DEATHS

19%
13%
43%

In a study of the years 1932 to 1936 the maternal mortality figure was 7.1 per 1,000 live births, with the toxemias accounting for approximately one-third of the deaths.

Deaths from toxemias of pregnancy (as recently reported by Lock and his Committee on Maternal Welfare):

North Carolina
Buffalo (1935-40)
Philadelphia (1933-43)
Minnesota (1934-42)

32.5%
10.0%
11.1%
6.25%

Hamilton studied 1,396 maternal deaths in North Carolina as related to the time of pregnancy that the pregnant woman first consulted a doctor, and found that 82.4 per cent of the total had some complication of pregnancy or concurrent disease when they first saw their physician, and that only 17.6 per cent reported for examination when they were presumably well. "If we assume that adequate prenatal care must begin before the end of the fourth month of pregnancy, 5.2 per cent gave their physician a fair chance to give them protection. In a second report, approximately 9 per cent of the small number included in that study reported to the physician before the end of the fourth month. It is evident that we have not yet made progress in our efforts to provide adequate prenatal care to those of our citizens who are creating new life."

Cooper, in his year's (1946) summary, states that in 1937 only 15.5 per cent of all births were in a hospital; in 1944, 51 per cent of the total births occurred in hospitals; and that 84.2 per cent of women who received E.M.I.C. care were delivered in hospitals (over 12,000). Lately, the picture has brightened. In North Carolina the total maternal mortality for 1941 to 1945 was 3.3 per cent, and for 1945 alone was 2.5 per cent. This, together with the low infant mortality of 43.4 per thousand live births, is most heartening.

That North Carolina is a rural state is readily shown when it is recorded that thirty-four counties have no hospital beds, and in fifty-five counties there is no bed for sick Negroes (there being a total of one hundred counties) and that in 1945 15,000 women were attended by midwives in a total of 85,000 live births. This is in the state where the first white "live birth" was recorded (also delivered by midwife according to Paul Green's book).

With no sharp demarcation there are three dietary groups of patients in North Carolina: (1) the intelligent economically capable, (2) the fairly co-operative adequately nourished, and (3) the uninformed improperly nourished medically inarticulate group. We have rarely found toxemia in the first two, but it is the prime factor in maternal mortality in the last.

We feel that the subsoil of toxemia of pregnancy is, paradoxically, prepared by improper dietary habits, usually lack of certain vitamins, minerals, and proteins, and by improper fluid intake and output. In our area such a patient would develop pellagra if exposed to the sun and, we feel, may develop symptoms of pregnancy toxemia if she becomes pregnant and does not present herself for treatment. Some of our findings are given support of this thesis. Whether simply parallel or actually causative is of little moment, when we realize that medical care will dispel the problem.

As soon as one sees a pregnant patient and starts any regulatory regime, that is prenatal care, and no one can stand by and allow a patient to develop toxemia symptoms.

The nearest approach to a control study is on the patient who is admitted with evidence of toxemia and who under diet, sedation and elimination is controlled but for some reason insists on leaving the hospital. The return to familiar domestic and dietary habits invariably leads to readmission, usually with more alarming symptoms.

TABLE I. PRESENTATION OF DATA, DUKE HOSPITAL, 1931-1946

Total deliveries	11,000
(Ratio white-Negro 8 to 5)	
Eclamptic state	309
(Convulsion = 203)	
(Nonconvulsion = 106)	
Deaths	35
(11.1% total)	
15.2% = convulsion)	
Other toxemias	1,493
Deaths	45 (or 3.7%)
Total toxemias	1,802 or 16.3% of all deliveries.
Total deaths from toxemia	80 (4.5%)
Percentage of total obstetric deaths = 38.2	
<i>Eclampsia Deaths</i>	
<i>Age:</i>	
16 patients = 15-20 years	
12 patients = 20-30 years	
7 patients = 30 plus	
<i>Parity:</i>	
18 patients = 0	
5 patients = 1-2	
5 patients = 3-5	
7 patients = 6 plus	
Negro = 21	
White = 14	
<i>Prenatal Care:</i>	
19 patients = None	
5 patients = 1 visit	
9 patients = 3 visits	
1 patient = Fair	
1 patient = Good	
(Only one regularly attended this Out Patient Clinic)	
<i>Convulsions Before Admission:</i>	
14 patients = 1-5	
10 patients = 5-10	
5 patients = 15 or more	
4 patients = None	
2 patients = Unconscious no information	
<i>Time From First Convulsion Until Admission:</i>	
4 patients = 1 to 3 hours	
8 patients = 3 to 4 hours	
13 patients = 5 to 10 hours	
7 patients = 10 plus hours	
<i>Distance travelled to hospital:</i>	
3 patients = Local (10-mile radius)	
5 patients = 15 miles	
6 patients = 25 miles	
9 patients = 35 miles	
5 patients = 50 miles	
7 patients = 60 plus miles	
Delivered at home = 6	
Undelivered = 8	
Artificial rupture of membranes = 11	
Low forceps = 2	
<i>Time from admission to delivery:</i>	
4 patients = 1 to 12 hours	
3 patients = 12 to 24 hours	
6 patients = 24 to 48 hours	
7 patients = 3 to 5 days	
1 patient = 5 to 7 days	
<i>Time in Hospital Before Death</i>	
1 patient = 15 minutes	
4 patients = 1 to 5 hours	
3 patients = 5 to 12 hours	
5 patients = 12 to 24 hours	
9 patients = 24 to 48 hours	
2 patients = 72 hours	
4 patients = 4 to 6 days	
7 patients = 7 to 20 days	
Stillborn = 13	
Viable Fetus = 14	
Autopsies = 23, or 74.3 per cent	

ANALYSIS

We have attempted to utilize the accepted classification for the late toxemias of pregnancy, but have found, as was anticipated, that often accurate classification is possible only on discharge of the patient. Our limited bed space prevents hospitalization of all but the severely toxic patients, and on discharge over eighteen hundred, or 16.3 per cent, of all patients delivered showed evidence of toxemia, as judged by a blood pressure of 140/90, albuminuria, and other findings. This figure at one time was over 30 per cent.

Our criteria for the eclamptic state are blood pressure 160/100, albuminuria, increased blood uric acid, and lowered CO_2 combining power associated with other usual findings. In this group we admitted two hundred and three patients with convulsions and 106 patients without convulsions. In the latter group four of the patients who later developed convulsions died. The death percentage in the eclamptic group was 11.1 per cent in the total and 15.2 per cent in those with convulsions. Nearly fifteen hundred patients had "other toxemia of pregnancy," the hypertensive and cardiovascular renal groups, the total mortality being forty-five, or 3.7 per cent. The total death from "late toxemia" being eighty or 4.5 per cent. These eighty deaths represent 38.2 per cent of all deaths in obstetric patients.

We have studied in detail the deaths of patients who had convulsions, knowing that there can be no doubt about the eclamptic state in such patients, and recording the death as a failure by someone somewhere in the course of the pregnancy. No effort nor desire is made to "correct" the mortality figure, however, a sincere effort is made to investigate it.

Seven of the thirty-five fatalities were in patients over 30 years of age, and twelve patients were para iii to para x, of whom two had previous eclamptic seizures, which indicates that the patient does not have to be a "young primipara." The inverse ratio of white and Negro patients is of interest. Our total deliveries have a ratio of eight white to five Negro, the deaths in this group is three Negro to two white.

The lack of prenatal care in this, as in other reports, stands out. Nineteen patients had not seen a doctor during the pregnancy until convulsions occurred. Five had made one visit to a doctor, nine had made three visits, one had "fair" prenatal care, and only one had care that was good. Only one patient had regularly attended our Out Patient Clinic.

Four patients admitted with the diagnosis of toxemia had not had convulsions, but three of them later convulsed. Two were unconscious and never regained consciousness; four had ten or more convulsions before admission (twenty-eight being the maximum), ten had five or more, and fourteen had one to five convulsions.

In seven of the patients ten or more hours had elapsed between the time of of convulsion and admission, thirteen had a lapse of five to fourteen hours, eight three to five hours, and four one to three hours.

To reach this hospital seven patients had to be transported over 60 miles (the longest distance being 150 miles), twenty over 25 miles, five, 15 miles, and only 3 had local residence.

Six of the patients had been delivered at home and eight died undelivered. Two patients were delivered by low forceps, these being the only operative deliveries.

Eleven patients had the membranes surgically ruptured. This procedure was done when the patient was in labor and delivery imminent, when the patient was thought to be stabilized and delivery thought to be desirable, or when the patient's condition progressively became worse and an effort was made to get the patient into labor. The incidence of infection in these patients was high (40 per cent), and two of them had gas bacillus infection post mortem. In the patients delivered there were nineteen viable infants and thirteen stillbirths.

The elapsed time from admission until delivery was one to twelve hours in four patients, twelve to twenty-four hours in three patients, twenty-four to forty-eight hours in six patients, three to five days in seven patients, and seven days in one patient. In the first and the last two categories we found most of the patients who had rupture of the membranes.

Similar information is obtained by listing the elapsed time from admission until death of the patient. One died within fifteen minutes, seven within twelve hours, five in twenty-four hours, nine in forty-eight hours, two in seventy-two hours, four within four to six days, and seven in a period of seven to twenty days. One patient was discharged and readmitted eighteen days post partum and died of urinary infection and empyema, but postmortem findings showed periportal degeneration of the liver. Another patient had a pulmonary embolus on the ninth postpartum day, but showed characteristic lesions of eclampsia.

Carter has reported the postmortem findings on these patients. It was only at this late investigation that we were able to classify accurately some of our toxemia patients. If the examination revealed the findings usually described in eclampsia, the patient was so classified. Certainly some of these fatalities are questionable. Because of the findings of the Smiths (increased gonadotropes with lowered estrogen assays) and the lesions usually described when the gonadotropes are increased (as chorionepithelioma), we were interested in the study of the ovaries and the pituitary for the possibility of increased luteinization of the ovary and anterior pituitary changes. Except for one patient who died without convulsing and in whom we found a basophilic adenoma of the pituitary and ovaries which were definitely hyperluteinized there were no other suggestive findings.

Discussion

On checking the localities from which our toxemia patients have been referred, and on reviewing the state morbidity and mortality statistics, we have found that in the same areas in which eclampsia occurred most often, we were likely to find a large percentage of pellagra and similar diseases. On close and repeated questioning and investigation we found that the patient that we see in eclamptic convulsions has come from the same group who subsisted on a diet similar to pellagrins. The diet is grossly deficient in all the vitamins, especially A, C, and D, as well as being inadequate in the minerals. The energy-producing

elements are adequate as a whole, but there is a protein deficiency. The animal protein consists chiefly of pork, which varies with the season. It is overabundant in the fall and winter, but inadequate in the summer. The largest proportion, estimated as 70 per cent, of the protein in the diet was furnished by the cereals and only approximately 30 per cent by meats, milk, and eggs. It is conceivable that, while the total amount of protein was adequate, the quality of the protein, or the quantity of the type of protein best suited for replacement of maternal tissue and blood proteins, was not entirely adequate. This possibility was borne out of the discovery of the relatively low plasma protein values. Also, on the basis of our knowledge of the group of the population from which most of the patients came, the dietary was very likely to have been deficient both in the quantitative and qualitative aspects.

In studying a group of such patients ante partum our figures for the plasma proteins in the fourteenth week ante partum agree fairly well with those found in the literature (ably reviewed by Dieckmann and Wagner) and show a general decrease as compared with values for normal nonpregnant women. This decrease is almost entirely at the expense of the osmotically more active albumin fraction, and is thus reflected in the figure for colloid osmotic pressure.

The lipin curves confirm in general the established tendency toward hyperlipemia in pregnancy. While, in common with other observers, large individual variations were found in our study of the total lipin, cholesterol, and phospholipid values, already considerably above normal levels at the beginning of our observations in the fourteenth week ante partum, tended to increase still further until parturition and fall to normal levels post partum. No striking differences were found which could be accounted for either on the basis of diet or of presence or absence of toxemic symptoms. The only general observation which can be made is that in pregnancy, as in other conditions involving hypoproteinemia, notably in nephrosis and in other forms of water retention, there appears to be a tendency toward a concomitant hyperlipemia. This may or may not be an expression of an attempt on the part of the organism to compensate for the fall in the colloid osmotic pressure due to the hypoproteinemia as suggested by Fishberg.

Aside from our own efforts in prevention and salvage of toxemia patients, it is gratifying to see the general purposeful efforts toward better prenatal care throughout this area. This state has for years sponsored lectures and refresher courses. Bradford, Hamilton, and the present Maternal Welfare Committee have reviewed the maternal deaths, a means that has been so brilliantly successful in New York, Philadelphia, Alabama, South Carolina, and other districts. The Board of Health has been especially helpful in checking birth certificates with female deaths and in having the County Nurse furnish additional information when the facts were vague or inconclusive. The State Medical Journal kindly allotted a page to the Committee, and each County Medical Society appointed a representative to confer with members of the Committee. In order to reach all citizens of the State, to inform them on health matters, and to provide facilities and personnel, a "Good Health" program has been instituted. Wise and humanitarian governors and legislators have listened to

the enlightened doctors and now have underway a program which should largely eliminate the menace of toxemia of pregnancy, the nutritional and other diseases which plague those who do not have recourse to medicinal care. Among the provisions are loans for medical students, utilization and coordination of all teaching facilities, utilization of all hospitals for interne and resident training, and rotation, peripheral postgraduate training, improvement of laboratory service, provision of consultation service, coordination of State wide medical care, integration of public health education and medical, expansion of the present two-year medical school at the State University, the building of hospitals where needed, and the alternate use of "Health Centers" where hospitals are not feasible. Such a program has particular appeal to the South and its traditional "States Rights" stand. It places squarely on the State its responsibility of aiding in the "ill" among its citizenry, a citizenry not recently favored by Federal grants and with notable exceptions, private philanthropy.

THE TREATMENT OF ECLAMPSIA AND PRE-ECLAMPSIA WITH VERATRUM VERIDE AND MAGNESIUM SULFATE*

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THIRTY years ago the delivery of an eclamptic presented no problem to the obstetrician: according to his simple philosophy the woman was having fits because she was pregnant; if she ceased to be pregnant there would be no reason for her to have fits; therefore he emptied her uterus forthwith, usually by manual dilatation of the cervix followed by forceps, or by version and extraction. About 30 per cent died, usually from shock and hemorrhage. As cesarean sections became more common they were performed on eclamptics, but with even worse results, for the death rate then rose to 40 per cent. In the middle 1920's, however, two articles appeared which changed the attitude of thoughtful obstetricians from radicalism to conservatism and have been the indirect means of saving many lives.

Strogonoff¹⁹ reported in 1926 a series of 300 personal cases, treated with morphine, chloral, and chloroform, and without active immediate interference, with a mortality of 2.6 per cent. Investigation, however, showed his Russian cases to be far milder than American eclamptics; in fact, many of his patients appeared to be merely advanced pre-eclamptics. The year before Lazard¹² had published a paper, also on the conservative treatment of eclampsia, in which he described the control of convulsions with the intravenous use of magnesium sulfate. He reported 20 cases with a mortality of 10 per cent. No American clinic which copied Strogonoff's regime was able to obtain results comparable with his as he had reported them. On the other hand, the use of magnesium sulfate, either intravenously or intramuscularly with or without sedatives, has become almost standard practice in large American clinics, although the results are not always all that might be desired. But, at any rate, we have learned that active interference with an antepartum eclamptic during her crisis of convulsions and coma is apt to end in disaster. If, on the other hand, we wait until the convulsions have ceased, the coma has passed off, and there is an adequate output of urine, we can induce labor by some simple means with much greater safety.

In 1935 Bryant² exposed to public view an old drug which in most drug-stores except those of Cincinnati had been accumulating dust on the back shelves. This drug is veratrum veride, described by the authors of a popular work on pharmacology as "practically obsolete today and enjoying a well-deserved oblivion."

Pharmacologists, like other people, are apt to say that a thing is no good if they know little about it, and it will be evident when we consider their accounts

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of the composition and pharmacologic action of veratrum veride, that they do, indeed, know little about it. Bryant's original paper, reporting 121 cases, and describing his treatment of eclampsia by the use of veratrum veride and magnesium sulfate, recorded a maternal death rate of 9.9 per cent. Another report with Fleming³ as co-author appeared in 1940; this time there were 121 eclamptics treated by the same method with a maternal mortality of only 1.6 per cent. These results in two large series of cases were so much better than any published in America that the Boston Lying-in Hospital decided to adopt Bryant's program, and it is with the outcome of our small series of 32 cases that the present paper is concerned.

But, before we proceed further, let us gratify our curiosity about this "obsolete" and "useless" drug which is treated so cavalierly by Goodman and Gilman.

There are three plants belonging to the Lily family, which produce the so-called veratrum alkaloids. The first is *Veratrum album* Linnaeus, the white or European hellebore; the second is *Schoenocaulon officinalis* Gray, the sabadilla; and the third is *veratrum viridi* Aiton, the green or American hellebore. Each is interesting for a different reason. From the rhizomes or root-stocks of veratrum album seven alkaloids have been isolated; these are germerine and protoveratrine, which are known to be active; and jervine, rubijervine, pseudojervine, protoveratridine, and germine, which are believed to be inactive. Veratrum album is important because its active alkaloids have been employed in most foreign investigations. From the seeds of the sabadilla plant is obtained veratrine, an alcoholic extract, which contains two active alkaloids, cevidine and veratridine, and at least one inactive one, cevine. The sabadilla plant is noteworthy because cevidine and veratridine can be obtained in pure crystalline form; and veratridine is of special interest to us in Boston because with it Kraye of Harvard Medical School has conducted the only recent systematic study of the veratrum alkaloids. Veratrum veride is of outstanding importance because from its rhizomes is obtained veratrone, the only drug of the veratrum group now in clinical use in the United States. Although careful analyses of veratrum veride have not been made, it is supposed to contain essentially the same alkaloids as veratrum album, with the possible exception of protoveratrine. Veratrone has a stated composition of 0.25 per cent pure alkaloids. It is prepared by extracting the rhizomes with alcohol, and vacuum distilling this extract to obtain a solid mixture, which is assayed, probably by chemical and gravimetric methods. It is then made up to the stated weight per volume, and 0.5 per cent chlorbutanol is added as a preservative.

Out of the confusion created by a review of the pharmacologic literature these opinions emerge: Probably the fall in blood pressure and the slowing of the pulse which follow the introduction of veratrum into the circulation result from a reflex stimulation of the vagus are (Cramer⁴). This stimulation begins in the chemosensitive afferent nerve endings in the auricles and passes to the medulla, where it acts upon the vasodilator center and the cardioinhibitory center. It then returns through the afferent fibers of the vagus, the vasodilator impulse passing to the peripheral arteries and arterioles, and the cardioinhibitory impulse to the heart again (Jarisch and Richter⁵). As long ago as 1867 von Bezold²² showed that cutting the vagus would prevent the effect of veratrum in lowering the blood pressure and slowing the heart rate. Recently Kraye and his co-workers^{10, 11} have devised an ingenious double dog experiment in which the heart of one animal is connected to its head only by its nerves.

Its heart receives blood from another dog through a constant perfusion pump. When veratridine is injected into this heart—isolated in a vascular sense but still in nervous communication with the head—the blood pressure in the head falls, thus demonstrating that reflex vasodilatation originates in the heart. In the opinion of most pharmacologists, this explanation of the action of veratrum is the correct one. Recently however, Willson and Smith,²¹ using veratrone, reported that they had produced vasodilatation by perfusion experiments in the isolated ear, kidney, and leg of rabbits, thus suggesting a local effect on the blood vessels. Moreover, they administered veratrone to vagotomized dogs and produced a distinct hypotension without a drop in pulse rate, although the fall in blood pressure was much less than when the vagi were left intact. This, they reasoned, indicated that afferent vagal reflexes are unnecessary for peripheral dilatation.

Although these results appear conflicting, it must be remembered that Krayner used veratridine, an alkaloid obtained from *sapadilla* for experimental purposes and never employed in clinical medicine, while Willson and Smith conducted their experiments with veratrone, the only preparation of veratrum readily available at present in the United States for therapeutic use. It should also be recalled that the alkaloids of veratrum veride, of which veratrone is a preparation, have never been completely isolated. They are assumed to be about the same as those in veratrum album, although there is no proof that they are. If the investigators working on this problem would employ the same substance for their experiments, it is likely that these results would be less at variance, and of more practical value to obstetricians.

So far no pharmacologist seems to have evinced the slightest curiosity about the anticonvulsant action of veratrum, although it is this effect which interests the practitioner most and it is the only one of any lasting benefit to the patient. Lacking scientific proof, however, we as clinicians may assume that the vasodilatation caused by veratrum relieves the cerebral anemia and edema which are supposed to cause the convulsions and coma of eclampsia.

Before leaving the pharmacology of eclampsia one should mention the toxic effects of overdosage. These are: vomiting; burning sensations in the mouth, throat, and stomach; profuse sweating; giddiness; headache; and in some cases relaxation of the vesical and anal sphincters. Therefore the initial intramuscular dose of veratrone in our clinic is restricted to 5 minims and is increased as conditions warrant.

Hellebore, from which veratrum is derived, has been known since the Middle Ages. In medieval times it was used to protect cattle from evil spirits, and the rootstalks employed for this purpose were dug up to the accompaniment of mystic rites. Sorcerers, when they wished to make themselves invisible, sprinkled themselves with the powdered substance. The American Indians, on the occasion of selecting a new chief, made an extract of hellebore and gave it to the young braves; and the one who vomited the least was made head of the tribe. Apparently he who had the strongest stomach was judged to have the stoutest heart. The early New England settlers used it as a crow poison, and horticulturists have long employed it as an insecticide.

Probably the first physician in America to use veratrum veride as a medicine was Osgood¹⁸ of Providence, Rhode Island. He described it somewhat obscurely as a "deobstruent, epispastic, and errhine," which being inter-

puted means, "a remover of obstructions, and a medicine to cause blisters and to be snuffed into the nose." He also described it as an acrid narcotic and emetic—which is plain enough—but he also made the fundamental and original observation that when it was taken internally it caused the pulse to be "small, compressible, and infrequent."

The next important figure in the history of veratrum veride was Norwood of Cokesbury, South Carolina, who devised the famous Norwood's tincture, which he first described in 1852. He manufactured it on a commercial scale and issued a prospectus which gave instructions for its use, quoted case histories, and ended with testimonials. That Norwood held a favorable opinion of his product is evident by this quotation from his prospectus of 1856.

"But when the unsurpassed value of the remedy is brought into account; when it is known that it possesses powers that cannot be supplied by any and every agent of the *Materia Medica*, singly or combined; when it is known that it is the only agent by which we can say to the tumultuous and tempest tossed heart in febrile and inflammatory diseases, be still, and lo all is quiet, and this wayward organ grows calm in all its actions, and the vital fluid flows smoothly and gently through all its channels, the price sinks into insignificance."

Aside from its use as a cardiac tonic it was also employed, and still is in some parts of the United States, in pneumonia and other febrile diseases.

Credit for the first use of veratrum veride to control the convulsions of eclampsia belongs to Baker¹ of Eufala, Alabama, who, in 1860, gave it to one patient with a successful result.

From then on veratrum veride was used sporadically in eclampsia and scattered reports appeared in the literature. It was not until 1895, however, that Reamy¹⁷ founded the veratrum school of Cincinnati of which the work of Bryant is the lineal descendant. Worthy of mention, however, is the paper of Mangiagalli¹⁴ of Milan, whose report appeared in England in 1908. He recorded 100 cases with a mortality of 12 per cent, whereas his death rate for the previous ten years had been 24 per cent.

Procedure

The general routine treatment for eclamptics at the Boston Lying-in Hospital follows in the main that of Bryant and Fleming. The patient is placed in a quiet, darkened room with a nurse in constant attendance. Morphine, one-fourth grain, demerol 100 mg. subcutaneously, or 3 drams of paraldehyde in 2 ounces of mineral oil are used to control restlessness, but are not given routinely. Five minims of veratrone are given hypodermically on admission. Veratrone is repeated as is necessary in 5 to 10 minim doses at twenty-minute intervals to keep the blood pressure below 150 systolic and the pulse below 80, or if there is a convulsion.

Magnesium sulfate in 50 per cent solution is given intramuscularly into the buttocks in 10 to 20 c.c. amounts every four to six hours. Magnesium depresses the central nervous system and the peripheral neuromuscular apparatus so that the excitation of voluntary muscle by nerve impulses is prevented. Magnesium depresses all portions of the central nervous system which leads to the loss of reflexes and a continuous fall in blood pressure. It also affects the heart muscle and produces bradycardia.

Two-hundred fifty cubic centimeters of 25 per cent glucose in buffered sterile water are given slowly every four hours if the patient is unconscious. If she is conscious it is given every six hours. The purpose of this is to encourage urinary secretion. In a few instances we have found the use of salt-poor albumin in 50-gram doses to be followed by a marked increase in urinary output and the disappearance of edema. Our results with plasma have not been so

satisfactory. Enough parenteral fluid is given to prevent dehydration and not enough to cause edema. If the patient is conscious she is given 2,000 to 2,500 c.c. of water every twenty-four hours.

Pregnancy is terminated only after the convulsions have ceased and an interval of twenty-four to seventy-two hours has elapsed. If the cervix is partially effaced and dilated enough to admit one or more fingers, the membranes are artificially ruptured; if not, a Voorhees bag is introduced. Cesarean sections are performed only on strictly obstetric indications, such as cephalopelvic disproportion or placenta previa. No cesarean sections were performed in our series upon antepartum or intrapartum eclamptics. Once induced, labor is allowed to proceed normally and to terminate, if the presentation be a vertex either by normal delivery or low forceps. Ether with oxygen is usually employed in normal deliveries; low spinal anesthesia for operative deliveries.

Results

Using this method, we have treated 32 eclamptics from 1940 to 1946, inclusive. Eighty-one and two-tenths per cent were primiparas. Convulsions occurred antepartum in 20 cases, or 62.5 per cent; intra partum in 5, or 15.6 per cent, and post partum in 7, or 21.9 per cent. Eleven patients had 1 fit, twelve patients had 2, one had 3, one had 4, one had 5, two had 6, one had 8 fits, one had 9, one had 13, and one had 14 fits. Six were comatose. In a detailed study of 18 of these cases Tower found the average normal blood pressure in those instances where it could be obtained to be 117/74 with a maximum rise to an average of 185/113. The average fall in blood pressure was 86/52, with an average dose of 10 minims of veratrine in an average time of forty-two minutes. The average maximum slowing of the pulse rate was 48 beats per minute. These 18 patients received an average of 11 to 12 doses, with an average total of 62 minims (about 4 c.c.). The greatest degree of albuminuria in the 32 patients was as follows: grade 4, 52.1 per cent; grade 3, 31.1 per cent; grade 2, 16.8 per cent.

Labor was induced in 18, or 55.6 per cent, of the cases; nine times by artificial rupture of the membranes, and in the remaining nine by the dilating bag.

There were 33 infants, including one pair of twins. Twelve infants were delivered normally and eleven by low forceps, these two methods making 71.7 per cent of the total. The remainder were delivered as follows: Braxton Hicks version (on nonviable infants) 5, breech extraction 3, Willett's forceps after Dührssen's incisions, one. One pre-eclamptic developed a convulsion after a cesarean section.

There were two maternal deaths, giving a mortality rate of 6.3 per cent. Both were neglected emergency cases admitted from small outside hospitals; both were moribund on entrance and died soon afterwards. Sixteen, or exactly 50 per cent, of the eclamptics were emergency cases. During the years 1940 to 1946 under study there were 18,686 deliveries in the public wards of the Boston Lying-in Hospital. The frequency of eclampsia in the registered clinic cases was once in 1,161 deliveries, and none of these eclamptics died. This speaks well for the value of prenatal care, and again emphasizes the truism that there can be no comparison between prevention and cure.

Eighteen, or 54.5 per cent, of the 33 infants were discharged alive; 13, or 39.2 per cent were stillborn; and 2, or 6.3 per cent, died. Nine of the thirteen stillborn infants weighed under 4 pounds. The total fetal mortality was 45.5 per cent.

The treatment of severe pre-eclamptics follows the same principles in a modified form. All pre-eclamptics of any degree are kept in bed, are given

magnesium sulfate by mouth to free watery catharsis, and are given a diet of 145 Gm. protein, 220 grains carbohydrate, 100 grains fat, and salt is restricted to 1.6 grains. This total is 2,200 calories. If there is a sudden hypertension, if the albumin increases notably, or if the patient develops symptoms of toxemia she is given 50 per cent magnesium sulfate intramuscularly in 10 c.c. doses every six hours for four doses, then every twelve hours for four doses, accompanied by veratrone in 5 minim doses sufficiently often to produce a fall in blood pressure.

Fig. 1 shows the maternal death rate by five-year periods from 1873 to the present day. The double vertical line marks the beginning of the veratrone-magnesium sulfate regime.

'73-'77-'82-'87-'92-'97-'02-'07-'12-'17-'22-'27-'32-'37-'42-'46

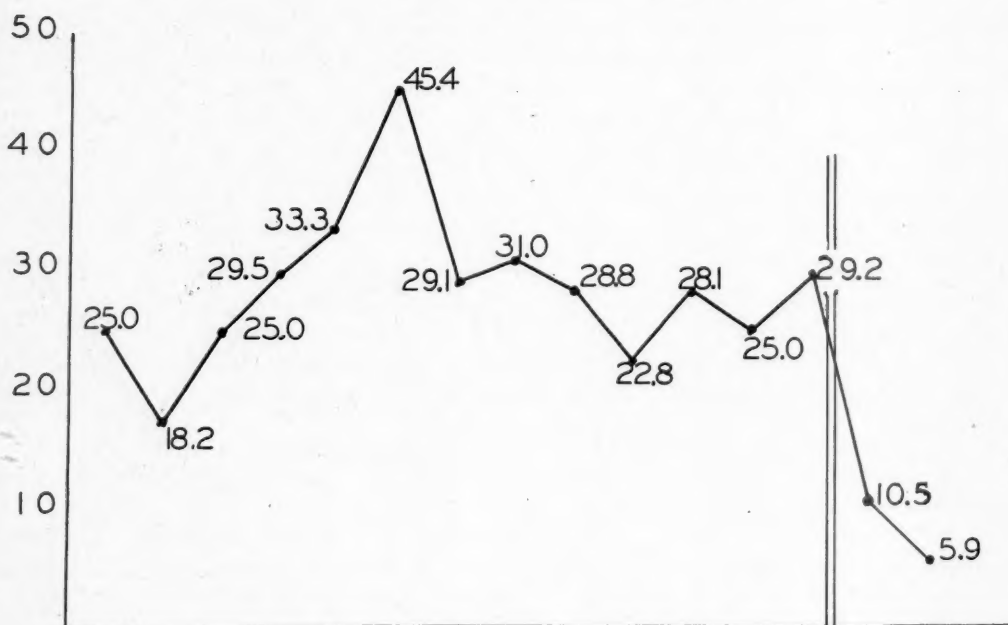


Fig. 1.

TABLE I.

	CASES	DEATHS	PER CENT
<i>Magnesium sulfate</i>			
Lazard	103	14	13.6
Dorsett	190	13	6.8
Rucker	129	6	4.6
	422	33	7.8
<i>Veratrone with or without Magnesium sulfate</i>			
Houltaim	14	2	14.3
Greene	14	0	0.0
Harkins	14	0	0.0
Bryant	121	12	9.9
Bryant and Fleming	120	2	1.6
Boston Lying-in Hospital	32	2	6.2
	315	18	5.7

Table I shows some collected statistics comparing the results obtained with magnesium sulfate alone with those attending the use of veratrone with or without magnesium sulfate. Although the results in both collections of cases are good, the advantage appears to be with the veratrone group. For a number of years at the Boston Lying-in Hospital our main reliance was on magnesium sulfate alone given intravenously after the technique of Lazard.¹³ Our results have been so much more satisfactory since we instituted Bryant's method that we shall probably continue to use it until something better appears.

Conclusions

In conclusion, it should be emphasized that no treatment will cure the grossly neglected eclamptic who arrives at the hospital breathing her last. The damage has already been done; nothing will save her life.

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MYCOTIC VULVOVAGINITIS AND THE VAGINAL FUNGI*†

A Report of 280 Patients

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INFECTION of the vulva and vagina, with certain of the nonascosporogenous, mycelial producing, yeastlike fungi, is a common cause of pruritus vulvae, vulvovaginitis, dysuria, and increased vaginal discharge. Infection is most common during the childbearing age. Pregnancy and diabetes are said to be predisposing factors to infection.

Prior to 1931, mycotic vulvovaginitis was not regarded as common, and only isolated reports appeared in the literature. At that time, Plass, Hessel-tine, and Borts¹ reported a large series of patients and directed attention to the frequency of the infection. They also gave accurate descriptions of the symptoms and clinical findings.

In recent years mycotic vulvovaginitis is more frequently recognized, and the belief is now firmly established that these infections rank with the trichomonad syndrome as a common cause of vulvovaginitis.

The incidence of mycotic disease of the vulva and vagina varies in proportion to the recognition of symptoms and to the facilities used for diagnosis. The failure to utilize simple methods of culture, in conjunction with intelligent interpretation of the mycologic findings, often leads to improper diagnoses and subsequent improper treatment.

Unlike trichomoniasis, the diagnosis of mycotic vulvovaginitis is occasionally made difficult by the presence in certain vaginas of saprophytic fungi which closely simulate pathogens, but are incapable of initiating symptoms. These fungi cannot be differentiated from vaginal pathogens without the use of cultural methods. Furthermore, it is well recognized that patients may carry potentially pathogenic fungi in the vagina for long periods without evidence of symptoms. A clearer understanding of the symptoms, clinical findings, as well as of the mycologic flora of the normal vagina, makes this problem less confusing.

The Vaginal Fungi

Almost without exception, fungi isolated from the vaginas or vulvas of the symptomatic, as well as asymptomatic, patients fall into a large group which is referred to as yeasts or yeastlike. The yeasts or yeastlike fungi reproduce by budding, by the formation of a septate mycelium, and in the true yeasts the formation of a sexual phase called asci.

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When grown on Sabouraud's agar, at room temperature, most of the yeasts or yeastlike fungi show similar colony formations and types of growth. Separation of the different genera, three of which commonly occur in the vagina, is based on morphology when the fungi are grown on special types of media, as corn meal agar for mycelial production, and carrot plugs for the production of asci. This method first proposed by Ota² in 1924 separates the vaginal group into *Saccharomyces*, *Cryptococcus*, and *Monilia*.

Since the generic terminology is determined by priority of usage, the name *Monilia* as applied to the anascosporogenous, mycelial producing, yeastlike fungi is known to be incorrect. According to Conant³ and others who have reviewed the taxonomy, "The first mention of *Monilia* was that of Hill,⁴ 1751, for the forms described by Michelli,⁵ 1729, under *Botrytis* and *Aspergillus*."

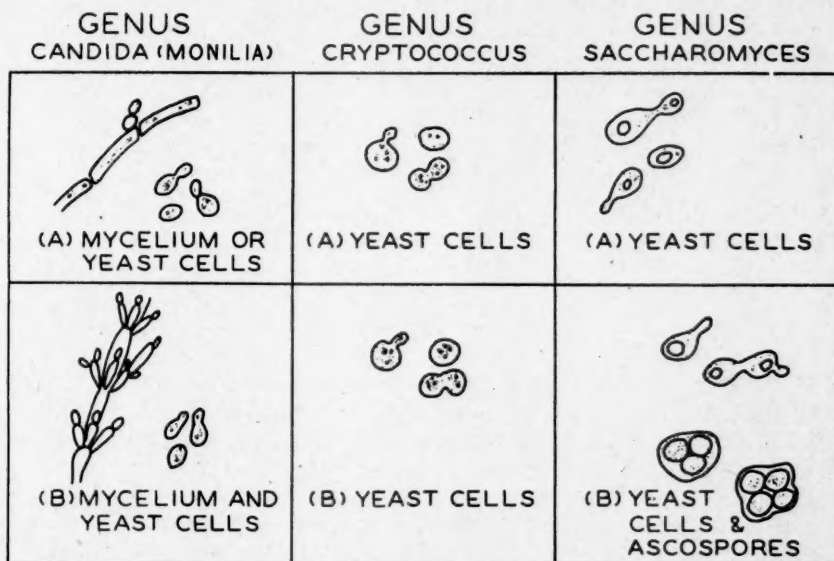


Fig. 1.—Generic Classification of the yeasts and yeastlike fungi from the vulva and vagina. The generic classification is based on morphology under special conditions of cultivation, i. e., corn meal agar for the formation of filamentous mycelium, carrot plugs for the formation of ascospores.

(A) Direct preparation from patient.

(B) In culture from corn meal agar and carrots.

In addition to *Monilia* a number of incorrect generic terms has been applied by different workers to this group of fungi. The confusion has been so great, that in 1939, at an informal meeting of Medical Mycologists at the Third International Congress for Microbiology, it was voted to substitute the name *Candida* for *Monilia*. It was the opinion of this group, that the existing confusion would be clarified if workers in this field would use only one generic term while awaiting official action of the International Botanical Congress. Consequently, the generic term *Candida* is now preferable and we prefer this term in our teaching and it is used in this paper.

This ruling rendered obsolete terms as monilia vaginitis and moniliasis of the vagina and vulva. However, since fungi belonging to the genus *Candida* seem to be the only fungi commonly involved in the production of vulvovaginitis, we prefer the term mycotic vulvovaginitis.

Differentiation of Genera

In Fig. 1 is shown the morphology of the three genera of common vaginal and vulvar fungi as they occur in the vagina and on special culture media.

The *Cryptococci*, or simple yeastlike fungi, occur in the vagina as yeast cells. Reproduction on corn meal agar, carrot plugs, and on Sabouraud's agar, is by budding or the formation of more yeast cells. Mycelia or ascospores are not produced under any conditions of growth.

At the present time there is no conclusive evidence of the pathogenicity of *Cryptococci* isolated from the vaginas or vulvas.

True cryptococcosis is a subacute or chronic infection of the lungs, skin, brain, or meninges and is due to an encapsulated species of *Cryptococcus* known as *Cryptococcus neoformans*. Benham and Hopkins⁶ have shown that non-pathogenic *Cryptococci* can be isolated from normal skin, mucous membranes, etc. Specific identification of *Cryptococcus neoformans* can be made by capsule identification and animal pathogenicity studies. The common vaginal *Cryptococci* do not form demonstrable capsules.

The true yeasts, or *Saccharomyces*, occur in vaginas as yeast cells. Cultivation on Sabouraud's agar usually produces only budding forms. Cultivation on carrot plugs or other suitable media results in the formation of the sexual phase or ascospores.

In our opinion both the vaginal *Cryptococci* and *Saccharomyces* assume importance only because they can so closely simulate and must be differentiated from species of *Candida*.

The genus *Candida* reproduces by the formation of yeast cells and the production of a vegetative mycelium. Both forms are frequently seen in the direct examination of vaginal discharge. If the material is from the vagina, the presence of mycelia by direct examination is presumptive evidence that the fungus belongs to the genus *Candida*. However, the finding of only yeast cells does not rule out the genus *Candida* or suggest either *Saccharomyces* or *Cryptococci*.

Cultivation on Sabouraud's agar produces yeast cells and a stage not easily differentiated from other yeasts or yeastlike fungi. Mycelium production on this medium is not consistent, and when it occurs on slants of Sabouraud's agar it does so only in the upper dried portion of the medium. In poured plates of corn meal agar, or on plates which after inoculation are overlaid with molten agar, mycelial production, at room temperature, occurs in from twenty-four to forty-eight hours.

Identification of Species Within the Genus *Candida*

The identification of species within this genus is based on biologic tests in combination with microscopic morphology and macroscopic colony formation. In 1938, Jones and Martin⁷ described methods of classification which were primarily bacteriologic and were based upon the study of fifty-nine strains of *Candida* isolated from the vaginas of patients in our clinic.

In Table I are shown the species of *Candida* commonly isolated from the vagina or vulva and the necessary criteria for identification. For a more detailed description of these methods reference should be made to previous reports.⁷⁻⁹

There have been few studies made on the classification of the genus *Candida*, in which fungi isolated from vulvas and vaginas were used to the exclusion of fungi from other sources. Plass, Hesseltine, and Borts,¹ in their original paper on mycotic vulvovaginitis used Castellani's¹⁰ classification. In later studies Hopkins and Hesseltine¹¹ expressed doubt concerning the accuracy of Castellani's methods and studied seventy-three additional strains of *Candida* by comparison with types 1, 2, and 3 of Stovall and Bubolz.¹² Only sixty-nine of these strains were regarded as classifiable, and sixty-seven were said to be type 2 of Stovall and Bubolz which is synonymous with *Candida albicans*.

TABLE I. SPECIES CLASSIFICATION OF THE GENUS *CANDIDA* (MONILIA) CONTAINING VAGINAL PATHOGENS

	SURFACE GROWTH SABOURAUD'S BROTH*	COLONY TYPE BLOOD AGAR†	CARBOHYDRATE FER- MENTATIONS‡		MORPHOLOGY CORN MEAL AGAR	RABBIT PATHOGEN- ICITY
<i>Candida albicans</i>	Negative	Grayish Large Round Smooth border	Dex Sacch Lact Malt	AG A - AG	Numerous Chlamydo- spores	Positive
<i>Candida stella- toidea</i>	Negative	Stellate	Dex Sacch Lact Malt	AG - - AG	Chlamydospores	Negative
<i>Candida tropicalis</i>	Bubbly	Grayish Large Round Mycelial fringe	Dex Sacch Lact Malt	AG AG - AG	Abundant my- celium	Slight (Stovall)
<i>Candida Krusei</i>	Heavy film	Small Irregular in size	Dex Sacch Lact Malt	AG - - -	Spores ar- ranged like crossed sticks	Negative
<i>Candida para- krusei</i>	Negative	Small Round White	Dex Sacch Lact Malt	AG - - -	Not distinctive	Negative

*Incubated 48 hours at 37°C.

†Incubated 10 days at 37°C.

‡AG = Acid and Gas; A = Acid; - = Negative.

As stated in the table given by the authors, the sixty-seven strains listed as type 2 rarely formed acid in saccharose. Since one of the differential points between *Candida albicans* and *Candida stellatoidea* is the ability of the former to form acid in saccharose, it is possible that the sixty-seven strains were in reality both *Candida albicans* and *Candida stellatoidea*.

In the original paper of Jones and Martin⁷ a new species of *Candida* isolated from vaginas was described. Since this fungus seems to be common only in vaginas and has undoubtedly been previously identified with *Candida albicans* the reasons for separating these two species are repeated here: (1) When grown on pH 7.4 beef extract sheep's blood agar plates at 37° C., for twenty-four hours the inoculum taken from a forty-eight hour culture in Sabouraud's broth, the rate of growth is different. Fairly luxuriant growth of *Candida albicans* occurs; the growth of *Candida stellatoidea* is much less luxuriant. (2) When freshly isolated strains of *Candida albicans* were injected intravenously into rabbits, death of the rabbits occurred in four to five days. Freshly isolated strains of *Candida stellatoidea* failed to kill rabbits when twice the lethal dose for *Candida albicans* was injected. (3) Slight differences in carbohydrate fermentations occur. (4) Slight differences in colony type are found when the fungi are grown on pH 7.4, beef extract, sheep's blood agar plates at 37° C.

Pathogenicity of Genus *Candida*

The pathogenicity of certain of the vaginal fungi belonging to the genus *Candida* has been proved. Reports on the production of symptoms by the experimental inoculation of the vagina with pure cultures has been uniformly successful.^{13, 14} On the other hand, the mechanism whereby symptoms are produced in some patients while symptoms are absent in other patients who carry in the vagina the same species of *Candida* is still not understood. The role played by individual sensitivity, variations in pathogenicity of fungi of the same species, high glycogen content of the vaginal mucosa, diabetes mellitus,

renal glycosuria of pregnancy, and low pH of the vaginal secretions has been stressed by different observers. It has been shown also that dissociation may occur in strains of *Candida albicans* which have been maintained for long periods on artificial media, and that this dissociation, with the resultant loss of animal pathogenicity, can be produced at will by the use of certain chemicals.^{9, 15} Liston and Chisholm¹⁶ believe that in the pregnant female glycosuria plays an important part, and that this should be considered when treating this type of patient. This is in agreement with Hesseltine's and Campbell's¹⁷ belief that the yeastlike fungi are the etiologic agents in the vulvovaginitis so frequently seen in patients with diabetes mellitus. It is our experience that in patients with diabetes and vulvovaginitis the incidence of yeasts and yeastlike fungi is extremely high. On the contrary, there are some patients in whom the vulvovaginitis cannot be explained on the presence of fungi.

As previously stated, freshly isolated strains of *Candida albicans* are pathogenic when inoculated intravenously in rabbits. This has been shown by Benham,¹⁸ Stovall and Pessin,¹⁹ and many others. Stovall and Pessin also found that *Candida tropicalis* would kill rabbits if enormous doses were used. Other vaginal fungi are nonpathogenic for rabbits. Rabbit pathogenicity is perhaps the most important differential point between *Candida albicans* and *Candida stellatoidea*.

The first successful human vaginal inoculation reported was that of Haussman,²⁰ who used the vaginal discharge from an infected patient to inoculate a pregnant female. Hesseltine, Borts, and Plass,¹³ in 1934, inoculated eighteen patients with pure cultures of two species of *Candida*. They were successful in establishing infection in twelve. The two species were classified according to Castellani's¹⁰ classification as *Monilia pinoyi* and *Monilia metalondinensis*. They were successful also in producing oral thrush in newborn infants with *Monilia pinoyi*, but were not successful with *Monilia Krusei* or *Saccharomyces cerevisiae*. *Monilia pinoyi*, *Monilia metalondinensis* and *Monilia Krusei* have been studied by Martin and Jones.⁹ The first two are synonymous with *Candida albicans* and the third with *Candida Krusei*. Bland, Rakoff, and Pincus,¹⁴ in confirming the results of Hesseltine and his co-workers, used strains isolated from patients with mild, moderate, and severe vulvovaginitis. The opinion expressed by these authors was that methods of classification answered no useful purpose. We therefore have no data on their strains other than the source of isolation.

Differential Diagnosis

Mycotic vulvovaginitis must be differentiated from trichomoniasis, non-specific bacterial vulvovaginitis, cervicitis, specific bacterial infections, chemical vulvovaginitis, atrophic vulvitis and vaginitis, leucoplakia, neurodermatitis, enterobiasis, pediculosis, or any disease or condition which produces pruritus vulvae or ani.

Differentiation should be made between, (1) those patients who harbor harmless saprophytic fungi in the vaginas or on the vulvas; (2) those patients who have positive cultures for potentially pathogenic species, but are asymptomatic at the time of culture; and (3) the symptomatic patients with a positive culture for species known to produce symptoms.

The physician who treats only the patients with obvious signs and symptoms misses many diagnoses of mycotic vulvovaginitis. Many patients are seen on whom the diagnosis is not obvious and can be made only by culture and by study of the fungus present. Pruritus is a frequent complaint in many varieties of vaginal and vulvar disease.

Symptoms

The symptomatology is fairly clearcut and much may be learned by proper and detailed questioning of the patient. The primary, the most common and the essential complaint is *pruritus vulvae*. A fungus etiology should be considered in all patients in the menstruating age with this complaint. The degree of pruritus varies considerably in intensity and many patients report periods of relief followed by exacerbations. In severe infection the itching may be more intense than that experienced in any other type of vulvovaginal disease. The high incidence of yeasts and yeastlike fungi in the vaginas of asymptomatic patients makes the treatment of patients who do not have pruritus an unwise procedure. In contrast to the patients with the trichomonad syndrome and nonspecific bacterial vulvovaginitis, many patients with mycotic vulvovaginitis state that they have some relief from the pruritus during their menstrual periods. This is probably due to the alkalinity of the menstrual blood. Other common complaints which are secondary to pruritus are irritation and soreness of the vulva and introitus with associated dyspareunia. Dysuria is another common complaint and occurs in the form of external burning due to the urine passing over the irritated vulvar areas. Increased discharge, although a common complaint, when due to the actual fungus infection is practically always preceded by pruritus. The complaint of discharge without associated pruritus should lead one to suspect some other cause. Patients also frequently complain of swelling and breaking out around the vulva or of a feeling of heat.

Clinical Findings

By far the most helpful physical finding is the presence of a white, flaky, or cheesy vaginal discharge. This discharge can occur around the labia minora, clitoris, in the vagina or on the cervix. When this discharge is detected it should be collected carefully for direct microscopic examination and culture. Vaginal and vulvar findings vary from apparently normal to a diffuse hyperemia of the vagina, cervix, and vulvar areas. In severe infections a granular type of vaginitis may be present. The vagina may bleed easily on touch. Slight edema of the vulva is seen frequently and acute edema is not uncommon. The edema subsides rapidly after therapy is started. Cutaneous lesions as an extension from the vagina are not common, but are occasionally seen.

Diagnosis

Since the yeasts or yeastlike fungi are the only group of fungi which commonly occur in the vagina, much valuable information can be obtained from the careful microscopic examination of a fresh saline suspension of vaginal discharge. In obtaining material for examination, great care should be taken to collect the cheesy or flaky discharge when present. We have found it a good practice to start at the introitus and collect any suspicious discharge as the speculum is inserted. Once the speculum has been inserted the posterior, anterior and lateral walls of the vagina should be carefully inspected. Careful inspection and collection greatly increase the chances of diagnosis both in the direct microscopic examination and in culture.

The Fresh Preparation.—We have found that the direct microscopic examination of a saline suspension of the collected material is far superior to either a stained smear or the use of KOH or NaOH solutions as used in the demonstration of the skin fungi. For the direct examination, the discharge is collected on sterile swabs. Approximately 1 c.c. of physiologic saline is added, the swabs are twirled in the saline, the suspension poured on a glass slide, covered with a cover glass, and examined microscopically with the low power objective. With experience the mycelial forms of the genus *Candida* are easily seen with the low power objective, and can be recognized with certainty with the higher power. The yeast cell or budding stage is not easy to recognize with the low power. The saline suspension also has the added advantage that trichomonads can be searched for in the same specimen.

Culture.—In a large number of patients fungi are not demonstrable by direct examination. This is particularly true in patients with a mild infection or the typical patient who takes a douche before visiting the doctor. In these patients cultures offer the only reliable method of diagnosis. All of the yeasts or yeastlike fungi which might be present grow readily on Sabouraud's agar slants at room temperature in from forty-eight to seventy-two hours. This makes culture so simple that it can be routinely employed, even in office practice, without a great deal of effort. The increase in the number of positive diagnoses in patients with obscure pruritus would certainly seem to justify this procedure.

The Intradermal Skin Test.—The use of a vaccine as a diagnostic procedure in skin testing patients suspected of mycotic vulvovaginitis is of little or no value. Carter, Jones, Thomas, and Ross,²¹ in 1940, showed that the incidence of fungi in the vaginas of the patients with negative skin tests was as high as in the patients with positive tests. Vaccines, however, are occasionally of some benefit in treating patients with marked sensitivity or who fail to respond to other types of therapy. In these patients skin testing prior to the administration of vaccine, as an indication of the correct dosage, is a justifiable procedure.

Agglutination.—The presence or absence of low titered agglutinins bears little, if any, relationship to the presence of fungi in the vagina.²¹ This fact would be expected because of the high incidence of yeastlike fungi in normal stools, in the mouths of normal individuals, and the number of "carriers" of these fungi in the vagina.

Treatment

Treatments of these infections have included x-ray and ultraviolet light, various types of therapy in the form of douches, powders, and salves. One of the greatest problems in the treatment of vulvovaginal mycotic infection is the avoidance of overtreatment, and the ability to determine where the fungus infection ends and the x-ray or chemical vulvovaginitis begins. The sensitivity of vulvar tissue and vaginal mucosa to strong chemicals is well known, and must always be kept in mind regardless of the treatment used. The dread of the gynecologist is the referred patient with vulvovaginitis which has been over-treated.

Most of the treatments in use require daily or bidaily office visits, are time consuming for the physician, and end too often with an unsatisfied patient. In our opinion x-ray is contraindicated in all types of vulvar disease. Furthermore, the treatment of the vulva fails to take into account the source of the infection, the vagina.

The commonest type of therapy used is 1 per cent aqueous gentian violet applied to the vulva, vagina, and cervix two or three times weekly. This, of course, cannot be done satisfactorily by the patient, is a messy form of treatment, soils the patient's clothing, and chemical reactions are not uncommon. In our experience the results obtained hardly justify its use. Other treatments in general use are carbosone, silver pierate insufflations, and suppositories and the iodides.

For the past two years we have been using a vaginal jelly with a bentonite base and calcium and sodium propionate as the active ingredients. A report now in press by Alter, Jones, and Carter²² gives the results of treatment, with follow-up cultures, on fifty-four patients. At the present time we have treated over one hundred patients with excellent results.

Some of the advantages of this form of therapy are: the jelly is prepared in tubes and patients are given an applicator which delivers a measured amount of jelly. The jelly is entirely innocuous, convenient to use, and does not stain the patient's clothing. Relief of pruritus and other symptoms in practically every instance is prompt. A cure was obtained after one series of treatments in 80 per cent of the nonpregnant patients and in 33 per cent of the pregnant patients. The criteria of cure are based on obtaining negative cultures. Even though cultural cures were not effected in many pregnant patients, symptomatic relief was obtained without fear of ill-effects.

Previous Related Study

In 1940, Carter, Jones, Thomas and Ross²¹ reported the results of cultures for fungi from the vulva and vagina of two hundred pregnant females. This earlier study was of an investigative nature. A mimeographed history sheet was used, and all patients were asked the same questions. No leading questions were asked. The only criteria for including the patient in the study were that the patient must be pregnant and have no previous voluntary complaint of symptoms referable to a vaginal mycotic infection. Since none of the patients had complained when symptoms were present, they were not unbearable from the patient's standpoint. This is shown further by the fact that if a positive culture were obtained, the patient was not informed, and only a small number required treatment during that pregnancy.

In Table II is shown the incidence of yeasts and yeastlike fungi isolated, and the number of patients who on close questioning had associated symptoms. Nineteen of the twenty-six symptomatic patients had a multiple infection with both trichomonads and fungi.

In considering Table II, several conclusions are possible: (1) The incidence of yeasts or yeastlike fungi on the vulva or in the vagina of the pregnant female is out of proportion to the symptomatology. This is particularly true of the clinic or Negro patient. (2) Compared to the high incidence, few require treatment. (3) Due to the lack of clear-cut symptoms and the high incidence of associated trichomonads, a study of this type is of only slight value in determining the most frequent vaginal pathogens. (4) The fungi isolated are of several genera and numerous species. (5) The number of strains of *Candida stellatoidea* isolated may be of some significance, but no definite conclusions regarding this new species is possible.

TABLE II. YEASTS OR YEASTLIKE FUNGI ISOLATED FROM THE VAGINA AND VULVA OF 200 OBSTETRIC PATIENTS WITH NO PREVIOUS VOLUNTARY COMPLAINT OF PRURITUS VULVAE

	NUMBER	PERCENTAGE	COMPLAINED OF SYM- TOMS ON CLOSE QUESTIONING
<i>Candida albicans</i>	20	10	10
<i>Candida stellatoidea</i>	38	16	15
<i>Candida parakrusei</i>	7	3.5	1
<i>Candida Krusei</i>	4	2	0
<i>Candida tropicalis</i>	2	1	0
<i>Cryptococcus sp.</i>	14	7	0
<i>Saccharomyces sp.</i>	2	1	0
Total incidence of yeasts or yeastlike fungi from vulvas and vaginas			43%
Total incidence of yeasts or yeastlike fungi from vagina			33%
Number of symptomatic patients with a multiple infection with both trichomonads and fungi			19

Present Report

The present report deals with a group of selected patients, both pregnant and nonpregnant, who sought medical advice because of pruritus vulvae and other symptoms referable to a mycotic vulvovaginal infection. Large numbers of records were reviewed carefully, and no patient is included with complicating diseases which could conceivably contribute to the symptoms.

In Table III are shown the fungi belonging to the genus *Candida* isolated from two hundred eighty of these patients. In this group there were one hundred eighty-nine nonpregnant patients and ninety-one pregnant patients. The ratio of white and Negro was two hundred fifty-one white and only twenty-nine Negro. These figures are somewhat misleading, as most of the patients were private patients and there would undoubtedly be more Negro patients in clinic practice.

TABLE III. SPECIES OF CANDIDA (MONILIA) ISOLATED FROM 280 PATIENTS WITH A CHIEF COMPLAINT OF PRURITUS VULVAE AND WITHOUT OTHER COMPLICATING FACTORS

	NUMBER	PERCENTAGE
<i>Candida albicans</i>	255	91.07
<i>Candida stellatoidea</i>	19	6.78
<i>Candida parakrusei</i>	5	1.07
<i>Candida Krusei</i>	1	0.36
<i>Candida tropicalis</i>	2	0.71
White patients 251	Gynecologic patients 189	
Negro patients 91	Obstetric patients 91	

The age incidence is interesting in that all of the patients were in the menstruating age with but three exceptions. Two patients were between 50 and 60 years of age, and one patient was over 60 years of age.

Discussion

Fungi belonging to the genus *Candida* are etiologic agents in a specific form of vulvovaginitis. Vulvovaginitis can be produced experimentally by the inoculation of normal vaginas with pure cultures of *Candida albicans*.

Although the disease is more frequently recognized, too much dependence has been put on classic findings at vaginal examination. Many patients do not show signs, and the diagnosis is not made because of the failure to use culture methods.

The tendency to treat pruritus vulvae as a disease and not as a symptom results too often in the overtreated or incorrectly treated patient.

Conclusions

1. Two hundred eighty patients with mycotic vulvovaginitis and without other complicating diseases are reported.
2. *Candida albicans* was isolated and identified from 91.07 per cent of these patients.
3. Other species of *Candida* produce vulvovaginitis in the occasional patient.
4. The vaginal fungi, symptomatology, clinical findings, and treatment are discussed.

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THE MANAGEMENT OF BREECH PRESENTATION*

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THE management of breech presentations is a controversial subject. It is of interest to most obstetricians and requires further study. We have analyzed 291 breech deliveries occurring in 6,476 consecutive deliveries in our private practice since September, 1928, an incidence of 4.49 per cent for breech deliveries. We have included all breech presentations occurring in single and multiple pregnancies when the baby weighed 1,814 Gm. (4 pounds) or more at birth. All pregnancies of twenty-eight weeks or more, and a few earlier pregnancies, were included by this standard.

As used in this discussion, private patients include all patients receiving prenatal care in our office, and patients referred to us as private patients during labor. Approximately one-third of our patients are referred to us because of various complications of pregnancy and labor. Our gross statistics include all babies who weighed 4 pounds at birth regardless of the condition of the baby and mother when we were first consulted. In two cases the fetus had died in utero before the onset of labor. Three mothers had eclampsia, and were referred to us because of convulsions and hypertension.

Our patients have all been treated individually. An attempt has been made to determine the advisability of vaginal or abdominal delivery before the onset of labor whenever it was possible. We believe in the conservative treatment of patients with breech presentations. The onset of labor should be spontaneous whenever the patient's condition permits this procedure, and the membranes should be kept intact until delivery is imminent. Because of complications in many of our patients this plan could not be followed.

When the mother's condition remains good and the labor progresses normally without any indication of fetal distress, we let the hips of the baby deliver spontaneously, and then, under anesthesia, we guide the shoulders and head through the birth canal. In assisting a breech delivery, and whenever it is necessary to extract a baby presenting as a breech, we follow Potter's technique. Piper forceps are applied whenever the head cannot be delivered easily. The Celsus-Wiegand-Martin maneuver can be used to advantage in delivering the aftercoming head through the pelvic canal whenever assistance is indicated. In our opinion Mauriceau's maneuver for delivery of the aftercoming head is dangerous, and frequently causes injury to the baby. We do not use this maneuver.

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In our cases episiotomy was performed 197 times in 236 vaginal deliveries, an incidence of 83 per cent. This procedure reduces trauma to both the mother and baby. We think the frequent use of episiotomy has reduced both our fetal mortality and traumatic injuries to the babies. Episiotomy necessitates anesthesia, and it can be done just before the extraction of the baby is started. No third degree laceration occurred in any case in this series.

Analgesia was given to all patients in this study except those delivered by elective cesarean section and some of those with uterine inertia. As used by us, analgesia usually includes hyoscine, one two-hundredth of a grain, and pantopon, one-sixth of a grain, also nembutal, one and one-half to three grain doses, with a total of not more than nine grains of nembutal in a prolonged labor, and a smaller total for short labors.

Irving and Goethals, in 1926, advocated shortening the second stage of labor in breech delivery and emphasized the importance of deep anesthesia for the patient. During the twenty-one years since this original publication, Goethals has contributed several other papers to the literature on this subject. He has obtained excellent results in breech deliveries by the extraction of the baby after the cervix is fully dilated. He still advocates deep anesthesia for the extraction, and emphasizes the danger of extended arms and the difficulty one often encounters with the aftercoming head even when the body delivers spontaneously. If the patient is awake when difficulty is encountered in delivering the shoulders and head, valuable time is lost while she is being anesthetized.

Hansen, in 1940, reported one hundred twenty-six breech deliveries occurring in 1882 consecutive private deliveries. After correcting for premature and abnormal babies his mortality rate for stillbirths and neonatal deaths was 0.8 per cent. Hansen stated, "Our method of treatment is conservative. By conservative treatment we mean giving supportive treatment to the mother with no interference unless labor is obstructed, progress ceases, or complications arise endangering the life of the mother, baby, or both."

Milton Potter, in 1945, advocated cesarean section for breech presentations in borderline pelvis, and particularly in primiparas. For vaginal deliveries he favors breech extraction, under deep anesthesia, after the cervix is completely dilated and the lower segment of the uterus is well effaced.

In a recent publication Guyer and Heaton report that at Bellevue Hospital the routine management of breech delivery vaginally is to allow spontaneous delivery of the baby until the umbilicus presents, after which assistance is given for the shoulders and head.

Potter, Bill, and many others have stressed the importance of full dilatation and effacement of the cervix for a successful vaginal delivery of a breech presentation, even in a normal pelvis. Again we emphasize the fact that an incompletely dilated cervix will often permit delivery of the baby's body, but it will make delivery of the shoulders difficult and it predisposes to extension of the arms. In these cases the cervix often contracts around the baby's neck, retarding delivery of the fetal shoulders and head, and causing unnecessary trauma to both the mother and baby. This often results in permanent injury or death to the fetus. When the mother and baby are in good condition, a short time in the second stage of labor, to reduce the irritability or contractility of the cervix, often facilitates the delivery of the shoulders and head. This should be remembered whenever extraction of a breech presentation is undertaken as a necessary or optional procedure.

Dieckman, in 1946, advised individual evaluation for each patient with a breech presentation. He states, "We do not believe in a routine prophylactic 'breaking up' of the breech and pulling down one or two legs, but we do use this procedure in selected patients where labor is unduly slow."

A review of the literature indicates that many obstetricians favor elective cesarean section for the patient with a breech presentation if she is an elderly primipara, and for the patient with a borderline pelvis if the size of the baby indicates cephalopelvic disproportion.

Siegel and McNally, in 1939, advocated external version in breech presentations to reduce fetal mortality in primary breech presentations. They reported 68 cases in which attempts had been made by external version to change breech presentations to vertex presentations. In 55 patients the versions were successful.

Ryder, in 1943, advocated external version for most breech presentations and reported an incidence of breech presentations at time of birth in 2.6 per cent of his private deliveries. His rate of 2.6 per cent is much lower than ours, which is 4.49 per cent for all breech deliveries. One's statistics may be easily influenced by the per cent of referred patients with complications, and this may be an important factor in our incidence of breech deliveries. Moore and Steptoe, in 1942, reported from The Johns Hopkins Hospital an incidence of breech presentations of 2.8 per cent of all births. If routine attempts to convert breech presentations to vertex presentations by external version are successful, fetal mortality rates can be lowered by this procedure. In our cases external version was rarely attempted. The figures so far presented for this procedure are not convincing.

TABLE I.

Total number patients (mothers)	290
Total number patients (babies)	291
Total number twin pregnancies (one breech)	18
Total number twin pregnancies (both breech)	1
Twin pregnancies, first baby breech	6
Twin pregnancies, second baby breech	12

All babies in this report weighed 1,814 Gm. (4 pounds) or more.

Table I shows the number of mothers and babies in this report. Twin pregnancies increase fetal mortality, but we have included them.

As shown in Table II, there were almost twice as many primiparas as multiparas in the cases we are reporting. This may tend to increase our fetal mortality rate.

TABLE II. DURATION OF PREGNANCY

	28-32 WEEKS	32-38 WEEKS	38-40 WEEKS	TOTAL
Primiparas	2	22	168	192
Multiparas	1	16	81	98
Total	3	38	249	290
Per cent	1.03	13.05	85.56	

TABLE III. TYPE BREECH PRESENTATION

	PRIMIPARAS	MULTIPARAS	TOTAL	PER CENT
Frank breech	147	69	216	74.22
Complete breech	32	22	54	18.55
Footling breech	13	8	21	7.21
Total	192	99	291	100

TABLE IV. ONSET OF LABOR

	NO. PATIENTS	PER CENT
Spontaneous	159	54.64
Medical induction	33	11.34
Medical induction and amniotomy	46	15.80
Voorhees bag	3	1.03
Premature rupture of membranes (spontaneous)	66	22.68

Prolapse of the cord did not occur in any case with artificial rupture of the membranes.

TABLE V. TYPE OF DELIVERY

	PRIMIPARAS	MULTIPARAS	TOTAL
Spontaneous	30	28	58
Breech extraction	85	51	136
Breech converted and extracted	35	7	42
Forceps to aftercoming head	73	17	90
Cesarean section	42	13	55

TABLE VI. AVERAGE DURATION OF LABOR (VAGINAL DELIVERIES)

	FIRST STAGE		SECOND STAGE	
	HOURS	MINUTES	HOURS	MINUTES
Primiparas	9	36	1	32
Multiparas	8	6	0	42

TABLE VII. COMPLICATIONS

	PATIENTS
Prolapse of cord	10
Premature separation of placenta	5
Placenta previa	0
Polyhydramnios	3
Toxemia (preeclampsia)	33
Toxemia (eclampsia)	3
Postpartum hemorrhage	11

Labor was induced in 28 per cent of our patients. Most of the inductions were done because of premature rupture of the membranes or maternal toxemia. It is interesting to note that prolapse of the umbilical cord did not occur in any case after artificial rupture of the membranes. We never intentionally rupture the membranes until the presenting part is well engaged in the pelvis.

As shown in Table V, the percentage of spontaneous deliveries was low, and the incidence of cesarean sections was high. These operations were usually indicated because of some type of cephalopelvic disproportion, but we do deliver by elective cesarean section many patients with breech presentations who would be given a trial labor with a vertex presentation.

The average duration of labor in both primiparas and multiparas was shorter in our cases than the average given in most textbooks on obstetrics. The longest labor in this study in a primipara was fifty-three hours, and the longest in a multipara was seventy-six hours.

The complications are shown in Table VII. There were ten patients in whom the umbilical cord prolapsed, but no fetal death occurred in this group. We attribute this to the fact that the fetal heart sounds are watched closely and recorded frequently when the breech presents. We usually stay near the breech cases when labor is active. Five patients developed premature separation of the placenta, but all had living babies. Five patients were transfused. In six patients the uterus was packed with gauze to control bleeding.

TABLE VIII. VAGINAL AND ABDOMINAL DELIVERY

Delivered vaginally	235 mothers	236 babies
Delivered by cesarean section	55 mothers	55 babies

The average age of patients delivered by cesarean section was 28.8 years.

TABLE IX. CESAREAN SECTION INDICATIONS

Generally contracted pelvis	30
Flat pelvis	11
Funnel pelvis	3
Cephalopelvic disproportion	2
Former extensive vaginal plastic operation	1
Borderline pelvis, irregular fetal heart	1
Former cesarean section, uterus didelphys	1
Former cesarean section, toxemia	1
Double vagina and cervix, prolapsed cord	1
Uterine inertia	2
Cervical stenosis	1
Toxemia, eclampsia	1
Total	55

TABLE X. FETAL MORTALITY

	TOTAL NUMBER	PER CENT
<i>Uncorrected</i>		
Stillbirths	5	1.71
Neonatal deaths	11	3.78
Stillbirths and neonatal deaths	16	5.49
<i>Corrected</i>		
Stillbirths	1	0.30
Neonatal deaths	7	2.40
Stillbirths and neonatal deaths	8	2.70

TABLE XI. STILLBIRTHS AND NEONATAL DEATHS

	NUMBER
<i>Stillbirths</i>	
Hydrocephalus (craniotomy)	1
Meningocele	1
Erythroblastosis fetalis	1
Antepartum death (cause undetermined)	1
Intrapartum death (cause undetermined)	1
<i>Newborn Deaths</i>	
Spina bifida	1
Multiple deformities	2
Congenital heart	1
Atelectasis	4
Cause undetermined	2
Maternal toxemia	1

Tables VIII and IX show the incidence of cesarean section and the indications, which are self-explanatory. For those who think the cesarean section rate too high we have two comments. One cesarean section for uterine inertia resulted in a stillborn apparently normally developed baby, and the operation should have been done earlier. This was the only stillborn baby in the group of patients delivered by cesarean section, and no newborn deaths occurred in this group. One other patient, a primipara 40 years old, was delivered by breech extraction and the baby died. She should have been delivered by elective cesarean section.

Table X shows the total uncorrected and corrected stillbirths and newborn deaths within three weeks after delivery for all babies weighing 1,814 Gm. (4 pounds) or more in 291 breech presentations.

The corrected stillborn and newborn death rate of 2.70 per cent could be lowered by omitting two fetal deaths occurring in babies whose mothers had severe toxemias. One of these fetal deaths is recorded under atelectasis. Four of the five stillbirths would have been lost regardless of the presentation, and four of the eleven neonatal deaths were unavoidable because of congenital defects.

TABLE XII. CORRECTED FETAL MORTALITY IN PRIMIPARAS AND MULTIPARAS

	PRIMIPARAS			MULTIPARAS		
	NUMBER DELIVERIES	FETAL MORTALITY	PER CENT	NUMBER DELIVERIES	FETAL MORTALITY	PER CENT
Spontaneous	30	0	0	28	0	0
Breech extraction	85	4	4.69	51	1	1.96
Breech converted and extracted	35	1	2.85	7	1	14.28
Forceps to aftercoming head	73	3	4.10	17	0	0
Cesarean section	42	1	2.35	13	0	0
Total (omitting forceps)	192	6	3.11	99	2	2.02

Our series of cases is too small to be of value when broken down as in Table XII. One might conclude from the figures on conversion and breech extraction that this is a dangerous procedure, but one of the two babies lost had multiple congenital deformities. An additional factor to consider is that breaking up the breech and then extracting it is resorted to in the most difficult cases. The same applies to the use of Piper forceps to the aftercoming head.

TABLE XIII. CORRECTED FETAL MORTALITY RATES OF VARIOUS AUTHORS
(Adapted from Guyer and Heaton)

AUTHOR	YEAR OF PUBLICATION	FETAL MORTALITY RATE, PERCENTAGE
Caldwell and Studdiford	1929	11.11
Cannell and Dodek	1934	6.75
Macafee and McClure	1937	6.10
Mohler	1938	5.50
Siegel and McNally	1939	12.10
Patton and Mussey	1940	3.77
Hawker and Soule	1940	4.81
Goethals	1940	7.40
Hansen	1941	0.80
Waters	1942	11.20
Tompkins	1943	2.70
Moore and Steptoe	1943	12.80
Guyer and Heaton	1946	4.50
Dieckman	1946	1.70
Ware, Winn, Schelin	1947	2.70

Table XIII is the original table of Guyer and Heaton brought up to date by the addition of the last three reports appearing in 1946 and 1947. This table is interesting, but of little value in comparing statistics because of the difference in the standards used in estimating and correcting fetal mortality. Babies weighing 4 pounds or more should be separated from those weighing less than 4 pounds as the chance for survival of babies born alive but weighing less than 4 pounds is very poor. We should use both gross and corrected rates for stillbirths and neonatal deaths.

Summary and Conclusions

Two hundred ninety-one cases of primary breech presentation, delivered as breech presentations occurring in 6,476 consecutive private deliveries since

September, 1928, have been presented. In this series there were five stillbirths and eleven newborn deaths, an uncorrected fetal mortality of 5.46 per cent. There was no maternal mortality in this series of cases.

After deducting for babies with congenital deformities incompatible with life, and two babies who died in utero before the onset of labor, the corrected stillborn and newborn death rate is 2.70 per cent for all babies weighing 4 pounds or more.

When the baby presents as a breech in an elderly primipara, or when a patient has a borderline pelvis and a large baby, delivery by cesarean section should be carefully considered and resorted to frequently.

There is a distinct difference between a fully dilated cervix and a fully dilated and paralyzed cervix. In breech deliveries the former frequently contracts around the baby's shoulders or neck and causes difficulty in delivering the shoulders and aftercoming head. When the cervix is fully dilated, retracted, and paralyzed it rarely interferes with the delivery of the shoulders and aftercoming head. Overextension of the fetal head in the delivery of a baby presenting as a breech is dangerous and often results in injury or death to the baby.

After the cervix is completely dilated and effaced, breech extraction under anesthesia may lower fetal mortality for trained and experienced obstetricians.

Episiotomy before delivery of breech presentations probably reduces trauma to the baby and mother and decreases fetal mortality.

Every woman in labor with the breech presenting should be watched closely and the fetal heart rate studied carefully for indications of fetal distress.

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THE PROBLEM OF DELIVERY OF THE NONRESIDENT PATIENT*

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IN LARGE obstetric services, both private and clinic, the management of labor in women who live at a great distance from the hospital in which they plan confinement is still a problem for the attendant. Especially was this true during the years of the recent war, at which time many smaller communities were deprived of an adequate number of physicians. The result was an influx of obstetric patients into urban centers. The number and variations of techniques in the management of such cases in use today offer proof that none has proved exceptionally successful for this type of patient. A review of the literature reveals that, so far, no routine systematic plan of management applicable to all such cases has been recommended. So far, this type of case has either been considered individually, or action has been taken based upon the requests and dictates of the woman as she approaches term with considerable apprehension for safety regarding the course of labor.

All too frequently one encounters a frantic patient, at or near term of a carefully supervised normal pregnancy, in an unexpected precipitous type of labor living at a remote distance from the attendant and hospital of her choice. On the other hand, recall the nonresident patient whose labor was complicated by prolonged dystocia secondary to uterine inertia and terminated by difficult operative interference after labor was electively induced rather than permit the patient to travel a long distance following the spontaneous onset of labor.

A survey of admissions to the maternity section of large urban hospitals convincingly reveals that the percentage of patients from rural districts and surrounding towns is on the increase.

Several factors influence women to decide upon delivery in urban hospitals at a remote distance from their homes. For the majority, the desire that labor be conducted under amnesic and analgesic medication in the hands of attendants specializing in obstetrics is the factor responsible for hospitalization away from home. For others, the safety and comfort of hospitalization, not available in smaller towns or communities, are the factors. Other women desire the services of an attendant specializing in obstetrics. Especially is this true of those who during a previous pregnancy encountered complications or difficulties. The latter always are difficult patients, inasmuch as apprehension regarding a successful outcome during labor is ever present. The desire to return to the obstetrician who successfully attended a previous pregnancy, better economic conditions, improved transportation facilities, and the decrease in the number of

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available medical attendants in smaller communities are other reasons why women seek obstetric care in urban centers. In all probability, the problem will increase rather than decrease, unless a successful answer lies in the establishment of hospitals in smaller towns as proposed by our government agencies.

In our city (Atlanta), many patients living within a radius of 25 to 250 miles are registered for care in the maternity section of the hospitals at the time of delivery. These women truly present a serious problem for adequate and satisfactory obstetric management. Inasmuch as the problem apparently is increasing, it is felt that there is need for the adoption of some systematized plan of management for the nonresident patient at the time of confinement.

Experience has convinced us that no single expedient is available to all cases. Too many factors must be considered in determining the course to be followed in the management of labor in this group of women. In considering a course of management in nonresident patients with normal pregnancies, three choices are available:

1. *Awaiting the spontaneous onset of labor at home.*—For patients living within a radius of 25 to 50 miles of the hospital, especially primigravidas, the attendant assumes that ample time will be available for transportation to the hospital after the spontaneous onset of labor in all but exceptional cases. This is based upon the fact that several hours usually elapse from the onset of ten- to fifteen-minute pains, to three- to four-minute pains when dilatation begins and the patient experiences considerable discomfort. For multiparas, especially those with a history of rapid previous labors, this plan is hazardous. Too often the latter are deprived of the comfort of analgesic and amnesic medication during labor, in addition to being subjected to both maternal and fetal danger by precipitate delivery en route to the hospital. It is our belief that this plan of management is not applicable with a great degree of safety to patients who reside beyond a radius of 50 miles of the hospital, unless a barbiturate is administered before leaving home.

Also, because of the ever present apprehension concerning arrival at the hospital in time for delivery, the incidence of "false labor" is greater among women who spontaneously enter labor at home. This type of patient not only demands attention needed by other more actively laboring patients, but invites meddlesome measures aimed at stimulation of labor and is often the victim of prolonged or difficult labor initiated by request or thought advisable by the attendant because of the distance between her home and the hospital.

2. *Establishment of residence in the vicinity of the hospital within a short time of the expected date of confinement.*—This may involve considerable expense, cause accompanying members of the family to remain away from their respective duties, or disturb the mental comfort of the woman as a result of separation from her family, especially if she has children at home. Too, pregnant women offer problems of individual care concerning their diet and recreation in both homes and hotels. Also, with the spontaneous onset of labor, transportation must be available. This plan is nearer ideal in cases where the patient can be placed in the home of relatives. One advantage of this method of handling lies in the possibility of attempting medical induction of labor one or more times at or near the expected date of confinement.

3. *Admission to the hospital for elective induction of labor.*—This plan of management, both for the convenience of the patient and attendant, has met with considerable favor during the past decade. That it does not prove to be the answer for all cases is borne out by statistics later in this paper.

It is far from the ideal form of management for the nonresident patient inasmuch as the success of induction, type of labor, and condition and size of the fetus cannot definitely be predicted at the time of attempt to initiate labor. Too often, in addition to maternal complications, the service of a nursery is overtaxed as the result of an excessive number of premature infants delivered of women thought to be mature at the time labor was induced.

Reviewing the literature, one finds that the indications for induction of labor have rapidly increased during the past decade. Among these appear "patients who live at distance from the hospital." One is not only impressed by the advantages of elective induction at or near term but is also made conscious of the dangers of the procedure in such a review.

Morton¹ reports induction of labor by means of artificial rupture of the membranes, castor oil and quinine and intranasal pituitrin. Guttmacher,² in 1931, and Slemmons,³ in 1932, reported on induction of labor by means of artificial rupture of the membranes, but stressed that the latent period and duration of labor are shorter whenever the cervix is naturally effaced and partially dilated at the time the membranes are ruptured for induction of labor. Stern,⁴ Plass,⁵ and Mathieu and Holman⁶ all report a low morbidity, mortality, and excellent results obtained by induction. However, as Roblee⁷ has pointed out, it must be remembered that their material was selected from abundance and that their skill, judgment, and environment were of the best.

On the other hand, in 1940, Cornell⁸ called attention to the dangers, both physical and legal, which are always present when one attempts to interfere with the normal processes of pregnancy and labor. He emphasized that it is not possible to predict when a patient is at term by the size of the baby physically or by x-ray, by the date of the period, or from quickening. He also pointed out the dangers of prolonged labor, increased fetal mortality, infection of the placenta, increased hemorrhage, prolapse of the cord, and increased morbidity associated with elective induction of labor.

Roblee,⁷ in 1946, after reviewing 500 cases of induced labor, concluded that the character and results of induced labor approach that of normal spontaneous labor only when it precedes by 48 or less hours the time when spontaneous labor would have occurred anyway. Other authors likewise point out the minor dangers associated with induction at term.

At present we are without an answer to predict the time or explain the cause of the spontaneous onset of labor. Reynolds⁹ is of the opinion that the cause of onset of labor is tied up with a change in the estrogen-pituitary-progestin balance, brought about by uterine distention. The most promising answer comes from Lyon¹⁰ in his search for the etiologic factors concerned in the time of onset of spontaneous labor. Using the glucuronic acid method he found that the sodium pregnanediol glucuronide curve of excretion in the urine decreased preceding the onset of labor at term, post mature, and in premature groups in a parallel manner. There was a positive relationship between a sudden drop in conjugated pregnanediol and the onset of labor.

As stated by Roblee,⁷ with this new knowledge available a different interpretation may be placed on the subject of induced labor. Certainly it offers an optimistic promise of valuable information to clinical obstetrics.

Inasmuch as the causative factors of the spontaneous onset of labor are still unknown, one must exercise caution in instituting any procedure aimed at the initiation of the process of labor. Too often, the clinical obstetrician must, in cases of dystocia due to uterine inertia, witness a miserable failure on the part of nature to complete a so-called normal process. Until a more satisfactory explanation of the causative factors involved in the onset of spontaneous

labor is offered, the obstetrician must rely upon some method of determining the most favorable time for the induction of labor which statistically offers the best results.

It is regrettable that statistics fail to answer some of our most perplexing questions regarding the safe time for the induction of labor. For example, on the part of the mother: is pregnancy at term? is the latent period to be dangerously prolonged? is the uterus capable of sufficient power? is the cervix to offer unexpected resistance. is infection a factor? and finally, is there increased danger of hemorrhages, trauma, or will difficult operative procedures be necessary? On the part of the fetus: is it mature? is there danger of prolapse of the cord? is deflection likely to be produced? is placental trauma possible? and finally, is it capable of withstanding trauma in the face of possible operative interference aimed at delivery? In short, unless the attendant is willing to assume that he has the answer for the preceding questions he must assume the moral and legal responsibilities associated with the potential dangers surrounding the initiation of a process which nature so far has not assumed.

Since it has been thought, and with good reason, that the possibility of spontaneous onset of labor at a place remote from that of planned confinement constitutes an additional hazard to the parturient, it seems that the adoption of some plan of management, study of procedures, and analysis of statistics concerning maternal and fetal results in this group of women would be of value.

We are convinced, in the handling of the nonresident patient, that if there is any single criterion which enables one to feel assured that the patient is near term or due, it is the change in the lower uterine segment and cervix which occurs as the majority of women prepare for labor. Especially is the change of value if it has been observed by palpation over a period of days or weeks by the same examiner.

Procedure

It is our purpose to outline a plan of management during late pregnancy, which not only will enable the mother to receive the full benefit of analgesia and amnesia and safety during labor, but which will also enable the fetus to reach a stage of safe maturity. Further, it is desired to emphasize a safe approach and method of inducing labor and, particularly, the conditions necessary in determining the contraindications to induction or postponement until labor can safely be initiated. Especially it is desired to emphasize the changes which occur in the cervix and time interval following a failure at induction which enable one to determine the safe time for a repeated attempt at induction in this group of women.

We have learned to attach great importance to the condition of the cervix—its length, consistency, degree of patency, location in the vagina, and relation to the overlying presenting part—in drawing conclusions regarding the proper time to initiate labor. Especially important are the changes observed by repeated pelvic examination during the terminal month of pregnancy or following a failure of induction by conservative measures. Too, we are impressed with the value and safety of office vaginal examination at the end of thirty-six and

thirty-eight weeks of pregnancy. On several occasions the results of an office rectal examination were not confirmed by hospital vaginal study following admission of the patient for induction. Several of such cases were dismissed with instructions to return at a later date for another sterile vaginal examination in the hospital. Too, it is important to point out that marked changes can occur in the cervix near the end of pregnancy within a period of only a few days, thereby converting an unfavorable to an ideal structure for inducing labor. These changes were especially outstanding after periods of five to fourteen days in women dismissed following unsuccessful attempts at induction by castor oil, intranasal pituitary drops, and stripping of the membranes.

In selecting the time for induction, in addition to the condition of the cervix, one must consider the parity, the necessary distance of travel if labor should start at home, the duration of previous labors, the size of the fetus, and the estimated date of confinement. Too much emphasis cannot be placed upon the menstrual history with any degree of accuracy. For example, one would suspect that labor would occur early if the last menstrual flow preceding amenorrhea was shorter than usual. In our experience this suspicion has not been confirmed.

Since we have learned to attach important significance to the condition of the cervix in determining the time for induction, or onset and duration of labor, it has been our custom to make a sterile vaginal examination at the office at the end of thirty-six weeks in these women. The findings are carefully recorded for comparison with a subsequent vaginal or rectal palpation at the end of two weeks. In any case, if vaginal examination at the end of 36 weeks reveals that the cervix still has some length or that the rim is thick, firm, not universally softened, not dilated more than 2 centimeters, and accompanied by a high station of the presenting part, the patient is permitted to return to her home for seven to ten days rather than attempt induction of labor. As a rule, this examination will enable one to decide if the patient is to be permitted to enter spontaneous labor at home, is to establish residence near the hospital, or is to be admitted to the hospital at a fixed date for a trial at induction of labor. In other words, in addition to evaluating the condition of the cervix, the examiner must be able to anticipate the rapidity with which subsequent changes in the cervix favorable for labor will occur.

It is felt that the management of patients living within a 50 mile radius of the hospital should be different from that of patients who live beyond that distance.

In the former, especially those capable of short labor, it is our custom to have the woman secure 3 grains of Nembutal during the latter weeks of pregnancy. She is instructed to take the capsules, after the onset of labor, before leaving home for the hospital. This medication not only allays apprehension and increases the interval between contractions, but also has a mild analgesic effect and serves as a preliminary medication to other analgesic and amnesic drugs to be administered after admission into the hospital. It has been found that, in order to be effective, the barbiturate should be used when uterine contractions are occurring at eight- to ten-minute intervals, otherwise it is of little or no value. If withheld until contractions are at intervals of five minutes or

less, it is valueless, and in some instances apparently accelerates labor. Especially is this true if the membranes have ruptured. It is not safe, even with barbiturate, for a multipara, living one to two hours' drive distant, to attempt to reach the hospital after the membranes have ruptured.

For those who present evidence of impending or short labors and live beyond a distance of 50 miles of the hospital, it is thought advisable to have them establish residence near, or enter the hospital for an attempt at elective induction of labor.

For those fortunate in securing residence near the hospital, pregnancy is permitted to continue to term and await spontaneous onset of labor, or medical induction is attempted at a later date. It is our custom to permit such patients to continue pregnancy until the calculated date of confinement before attempting medical induction. The simple method of administering two ounces of castor oil followed by a hot soapy enema after thorough bowel evacuation has proved highly satisfactory for these cases. We are not convinced that the addition of quinine to the procedure has additional value. Too, as a rule, if castor oil is ineffective in producing labor, the pregnancy will advance five or more days before the spontaneous onset of labor. Therefore, it is not advisable to repeat the procedure short of that time.

For patients living a distance of more than 50 miles from the hospital the course of management should be directed differently, if unable to establish residence in or nearer the hospital to await spontaneous labor. For this group of women it is felt that a slightly increased degree of responsibility must be assumed on the part of the attendant and the patient be admitted to the hospital for a trial induction of labor. If, after admission, vaginal examination reveals that the cervix still has some length or the rim is thick, not softened and not dilated more than 1 to 2 centimeters, it is best to avoid attempted induction and select another course, even if the patient is at or past the expected date of confinement. Often this decision will save the patient a prolonged inertia type of labor and the usual complicated operative procedures necessary for its termination.

In discussing elective induction of labor in women presumed to be at or near term, it is necessary that the parity and rapidity of previous labors be considered.

In the nulliparous woman possessing a doubtful cervix, it has been our custom to administer 2 ounces of castor oil following complete preparation for labor, after admission into the hospital. This is followed by a hot soapy enema after the bowels are evacuated. In many cases this simple procedure has been effective in producing labor. At the end of eight to ten hours, if labor is not established, pitocin, administered as intranasal drops every fifteen minutes for twelve doses, is started. Following the intranasal medication a vaginal examination is done and the membranes gently stripped by the examining finger, for 1 to 2 centimeters around the internal os. If labor has not started within twenty-four hours following these procedures, the patient is permitted to leave the hospital and establish residence in the vicinity of the hospital, but not return home.

On the other hand, in nulliparous patients with very thin, soft, elastic, and partially dilated cervices, the membranes are stripped and ruptured following the series of twelve doses of intranasal Pitocin. In some cases, it is necessary to repeat the Pitocin drops in series of 10 to 12 doses at 4 hour intervals after the membranes are ruptured before labor is well established.

In multiparous women, due to the usual high station of the head before labor is well under way, care should be exercised in promiscuously rupturing the membranes artificially in an effort to initiate labor. In this type of patient, it is best to administer castor oil, use Pitocin drops and adhere to a policy of stripping the membranes, reserving artificial rupture of the sac until the head

is lower and labor is well established. It is true that actual rupture of the sac insures labor and is more spectacular in result, yet, the ever present possibility of a prolapse of the cord in multiparas must constantly be kept in mind.

Naturally, if, at any stage of the program, labor is in evidence, one should omit subsequent steps and permit labor to progress in a normal manner. It has been our experience that once labor seems initiated with castor oil, time should be permitted for it to proceed to forceful contractions before additional stimulation is begun. In the presence of subsiding contractions, supplementary and persistent stimulation by pituitary products, intranasally or subcutaneously, is less likely to be effective and often produces a prolonged course in a patient who otherwise would have gone several days longer before the onset of labor. In other words, the uterus was not ready for labor.

TABLE I. RESULTS OF MANAGEMENT OF 187 NONRESIDENT PATIENTS
(Determined by Pelvic Examination Late in Pregnancy)

Distance	30 to 250 miles
Parity { Primigravidas	89
{ Multigravidas	98
Instructed to await onset of labor at home	76
Advised to establish residence nearer hospital	35
Admitted to hospital for induction of labor	76
Time of pelvic examination	40 to 0 days before delivery
Maternal mortality 0	Infant mortality 3 (1.6 per cent)

That the nonresident patient can have hospital delivery, secure the service of an obstetric specialist, receive analgesic and amnesic labor and successful delivery of a mature infant, may be seen from an analysis of 187 such cases in which management was determined by vaginal and rectal examinations made late in pregnancy. Table I shows an analysis of the methods of management of this group of women. The deliveries occurred between 1941 and 1946 and in the majority of cases the examinations and deliveries were conducted by one of us (R.A.B.) during military service of the co-authors.

The distance between the permanent home and the hospital varied between 30 and 250 miles. Without doubt war conditions were responsible for a number of the cases, inasmuch as many women preferred to remain at training sites with their husbands as long as possible before delivery. Too, the inadequate medical service resulting from military demands for the more active physicians in smaller towns and cities caused many women to seek obstetric care at a distance from their homes. However, for the majority, the demand for analgesia and amnesia in the hands of an obstetric specialist was the factor. In the group were 89 primigravidas and 98 multigravidas.

In regard to management, following evaluation of the cervical findings by pelvic examination in the office, 76 were instructed that it would be safe to enter spontaneous labor at home; 35 were advised to establish residence nearer the hospital inasmuch as short labor was expected, and 76 were admitted to the hospital for induction of labor because it was considered possible that the necessary distance of travel or danger of short labor would be hazardous. The pelvic examinations, as previously described, were done between 40 days before and the estimated date of labor. The maternal mortality was zero, the fetal mortality 3 (1.6 per cent).

Table II shows an analysis of the results in 76 women living between 30 and 83 miles of the hospital who were told that it would be safe to travel to the hospital following spontaneous onset of labor. All 76 reached the hospital in time for complete preparation and delivery. No precipitate delivery occurred, but one woman, a multipara, traveled 30 miles and was delivered thirty-five minutes after admission to the hospital. The average duration of labor

TABLE II. SEVENTY-SIX PATIENTS INSTRUCTED TO AWAIT ONSET OF LABOR AT HOME
(Average duration of labor 14 hours; 48 primigravidas and 28 multigravidas)

	NUMBER	PER CENT
Admitted to hospital in ample time for delivery	76	100.0
Ample time for satisfactory analgesia and amnesia	68	89.4
"False labor," returned later in true labor	4	5.2
Barbiturate, preceding transportation	40	52.6
effective	24	60.0
not effective (membranes ruptured in 6)	16	40.0
Mortality (1 fetal monster)	1	1.3
Distance of travel after onset of labor, 30 to 83 miles		

(48 primiparas, 28 multiparas) was, in round numbers, fourteen hours. In 68 cases (89.4 per cent), the patients were admitted in ample time to secure satisfactory analgesia and amnesia before delivery. In the remaining 8 (10.6 per cent), the pain relief was not adequate because of advanced labor at the time of admission. Six of the latter were multiparas. In four instances the labor proved to be false. All four returned to their homes following a stay of a few hours in the hospital and all later returned and delivered after spontaneous onset of labor. Of 40 cases receiving 3 grains of nembutal before admission, 24 (60.0 per cent) noted an appreciable effect upon uterine contractions. All of these received the medication before the contractions were less than eight minutes apart. In 16 (40.0 per cent), six of whom had had the membranes rupture prematurely, no effect was apparent. In all of 16 the charts revealed the presence of contractions at intervals of less than eight minutes at the time the medication was used. In this group there was one fetal mortality, a 34-week monstrosity, weight 4 pounds, 8 ounces, which died within thirty minutes after birth.

TABLE III. THIRTY-FIVE PATIENTS ADVISED TO ESTABLISH RESIDENCE NEARER HOSPITAL
(Average duration of labor nine hours; 17 primigravidas and 18 multigravidas)

	NUMBER	PER CENT
Satisfactory analgesia and amnesia	35	100.0
Spontaneous onset of labor within 8 days	13	37.1
Induced with castor oil (toxemia 2, overdue 6)	10	28.5
Morbidity and mortality	0	---
Distance of permanent home from hospital (50-200 miles)		

TABLE IV. SEVENTY-SIX PATIENTS ADMITTED TO HOSPITAL FOR INDUCTION OF LABOR
(Average duration of labor eleven hours; 24 primigravidas and 52 multigravidas)

	NUMBER	PER CENT
Correct prediction of cervical changes favorable to induction	69	90.7
Induction not attempted, cervical changes not as predicted	1	1.3
Induction, attempted	75	98.6
success	69	92.0
failure	6	8.0
Deliveries, pelvic	74	98.0
cesarean	1	2.0
Mortality, fetal (1 prepartum, 1 polyhydramnios 4 pounds, 3 ounces)	2	2.6
Morbidity, maternal	3	4.0

Table III is an analysis of 35 cases in which, because of expected short labor or great distance of the home from the hospital, it was advised that residence be established nearer the hospital within a period of seven to thirty days of the time of delivery. Seventeen were primigravidas and 18 were multiparous.

women. All of these lived at a distance of more than 50 miles from the hospital. All 35 received satisfactory analgesia and amnesia during labor. The average duration of labor was, in round numbers, nine hours—five hours shorter than the average for patients permitted to enter spontaneous labor at home. In 13 (37.1 per cent), spontaneous labor had its onset within eight days after the date selected for establishing residence nearer the hospital. Labor was induced with castor oil in 10 cases (toxemia 2, overdue 6), following establishment of temporary residence. The maternal and fetal morbidity and mortality were zero for this group.

Table IV is an analysis of 76 cases admitted to the hospital for induction of labor after cervical findings on pelvic examination in the office at some time during the previous thirty days had revealed evidence that labor would be of short duration or because the distance between the home and hospital was great, and in some cases, because the woman was unable to secure residence nearer the hospital.

Of these, 24 were primigravidas and 52 were multigravidas. In 69 (90.7 per cent), the vaginal examination made at the time of admission revealed cervical changes confirmatory of those expected seven days to four weeks earlier in selecting the date of admission as the proper one for inducing labor. In 7 (9.3 per cent), the preadmission examination had given a false impression of the findings; four by rectal, had been misinterpreted by the examiner on selecting a date for induction. One patient, examined by vaginal thirty days and rectal seven days before admission, was found to have a cervix unsatisfactory for induction at the time of vaginal examination when admitted. She was dismissed from the hospital, established residence near by, and entered a spontaneous twenty-five-hour labor, fourteen days later, three weeks after the original expected date of confinement. The labor was complicated by uterine inertia and terminated by midforceps delivery. Of the 76 cases thought ready for induction, 75 (98.6 per cent) were subjected to an attempt at induction. In 69 (92 per cent), it was successful, but in 6 (8 per cent), efforts short of artificial rupture of the membranes met with failure. One patient of five who failed to enter labor following routine preliminary medication and stripping of the membranes returned in spontaneous labor four days later with a distinct sour odor of the vaginal discharge, placenta, and membranes at the time of delivery. She was afebrile during labor and the puerperium. Of the 75 successful inductions, 74 (98 per cent) were delivered through the pelvis and one (2 per cent) by laparotrachelotomy because of uterine inertia complicating labor with a large fetus (9½ pounds). The maternal mortality was zero. Two infants (2.6 per cent), a 17-day prepartum diabetic at 8 months, and a 4 pound, 3 oz. premature associated with polyhydramnios, were lost. Three cases (4 per cent) of mild postpartum uterine infection occurred in this group.

TABLE V. METHODS OF INDUCTION OF LABOR, 75 CASES

	NO.	PER CENT	SUCCESS	FAILURE
Castor oil	3	4.0	--	--
Castor oil and intranasal Pitocin drops	5	6.6	4 (80%)	1 (20%)
Oil, drops and stripping of membranes	11	14.7	6 (54.5%)	5 (45.5%)
Oil, drops, stripping and artificial rupture of membranes	30	40.0	30 (100%)	--
Oil and artificial rupture of membranes	26	34.7	26 (100%)	--

Table V shows the methods and incidence of success and failure in the 75 cases in which an attempt was made at induction of labor. In 3 (4.0 per cent), castor oil alone was effective. In 5 (6.6 per cent) castor oil was supplemented by intranasal pitocin drops. One of these previously mentioned, in which it

was considered unwise to take additional steps aimed at stimulation, was dismissed and re-entered the hospital four days later in spontaneous labor. In 11 cases (14.7 per cent), in addition to preliminary oil and intranasal drops, the membranes were stripped but not ruptured. Six (54.5 per cent) of these were successful, but in 5 (45.5 per cent) the measure failed and the women were dismissed from the hospital twenty-four hours later and instructed to remain near the hospital. Four were subsequently admitted to the hospital eleven to fourteen days later, during which time cervical changes favorable to induction had occurred. The castor oil and nasal drops were repeated and the membranes artificially ruptured. All four were delivered, three spontaneously, and one by midforceps following a fifteen-hour labor. The other woman entered spontaneous labor four days after dismissal from the hospital. In 30 patients (40 per cent), in addition to oil, drops and stripping of the membranes, the membranes were artificially ruptured to stimulate labor, either after it was established, or after it was found that cervical changes favorable to labor were present. In 12 (40 per cent), the membranes were ruptured at the time of stripping, and in 16 (60 per cent) rupture was reserved for a period of four or five hours after stripping was done. In 26 patients (34.7 per cent), oil was administered and the membranes artificially ruptured simultaneously. All of these, with the exception of one, entered labor with a latent period of less than six hours. The latter, with a latent period of nineteen hours, began labor following a series of 12 intranasal doses of pitocin and spontaneously delivered within seven hours.

It is therefore apparent that, by examination of the cervix in the office during the terminal thirty days of pregnancy, we have a means of satisfactorily predicting an approximate time for the onset of labor and, furthermore, are able to advise more accurately the nonresident patient of the measures she should take late in pregnancy in order to secure safe delivery, analgesia and amnesia during labor, a mature infant, and a minimum of maternal and fetal morbidity and mortality. If, after admission, one finds that changes have not occurred in the cervix as expected during the last two or three weeks, it is better to refrain from proceeding beyond the limit of stripping the membranes and permit the patient to proceed in pregnancy for another ten or fourteen days before reattempting to induce labor. The safety and wisdom of such a policy are illustrated by one of the cases. A multipara was examined in the office by the vaginal route thirty days and by rectal seven days before a date set for elective induction. At the elective time of admission the cervix had not undergone the expected changes, remained thick, firm, and closed. An attempt at induction was not made and she was dismissed from the hospital. Two weeks later and three weeks after the expected date of confinement, she spontaneously entered a sluggish labor complicated by primary uterine inertia which was terminated by midforceps twenty-five hours later. Failure to appreciate the fact that this case was not ready for labor two weeks earlier might have resulted in increased danger to the mother and her infant.

The fact that four other patients went eleven to fourteen days longer, after an attempt to induce labor by stripping the membranes, before developing changes in the cervix and lower uterine segment indicating that induction would be safe, is proof that one should proceed with caution in artificially rupturing the sac when induction is considered.

Briefly, therefore, vaginal examination under sterile precautions at intervals of four and two weeks of the expected date of confinement enables one to decide upon the approximate time of confinement or type of management of such cases. The ability to predict changes in the cervix indicative of term pregnancy is to be acquired by a careful interpretation and recording of changes which occur in the structure from week to week as pregnancy advances.

By the careful evaluation of such changes combined with a consideration of the parity, rapidity of previous labors, size of the fetus and pelvis, estimated date of confinement, and distance necessary to travel following onset of labor, one is not only able to secure uniformly satisfactory results, but insure the mother of adequate pain relief at the time of labor.

Conclusions

1. The management of pregnancy and labor in the nonresident patient constitutes a definite problem to the attendant.

2. Changes occurring in the cervix and lower uterine segment during the terminal weeks of pregnancy are consistent and, at present, offer the most valuable information as to the time of onset and type of labor to be expected.

3. The condition of the cervix, as determined by vaginal examination at four and two weeks of expected date of confinement, enables one to predict with a high degree of safety the time of confinement.

4. Rectal examinations fail to convey accurate information and are often the cause of false interpretations. Such examinations are of value only when checked by vaginal palpation prior to actual induction.

5. Vaginal examination, in the office, under sterile precautions, at the end of thirty-six and thirty-eight weeks of pregnancy does not increase the incidence of infection at the time of delivery.

6. When practical, nonresident patients should establish residence at a safe distance of travel to the hospital.

7. The administration of castor oil followed by series of pitocin drops intranasally offers a highly effective safe method of inducing labor. When not effective, the additional stripping of the membranes insures a higher degree of success without danger to the mother or fetus.

8. Artificial rupture of the sac should be reserved until labor has been initiated by conservative measures, or reserved for cases in which the cervix is well effaced, soft, partially dilated, and in close contact with the presenting part.

9. A uniformly successful plan of management in labor for nonresident obstetric patients, based upon statistical results, is desirable.

10. Such a plan of management developed in the care of 187 nonresident obstetric cases is herewith presented.

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THE NATURE OF DYSMENORRHEA*†

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ESTIMATES of the number of women who suffer from dysmenorrhea at some time in life vary. Combining all reports, one is justified in the statement that probably one-third of all young women in America are afflicted. The problem from a practical standpoint has been stated in a graphic fashion by Haman,¹ who calculated that approximately 140 million hours are lost annually due to this cause, and that this loss of time represents an entire year of work by approximately 58,000 women.

Throughout the past century many theories concerning the nature and etiology of dysmenorrhea have been advanced, each of which has been speculatively based upon discovery of new facts. Each has had widespread influence on the study and management of dysmenorrhea during the period of its popularity. An early theory revived by Sims² held that the condition arose from obstruction of the cervical canal. This idea was sustained for many years and gave rise to all sorts of manipulative procedures to maintain a straightened or patent cervical canal. These ranged from dilation and cervical pessaries to the operation of Dudley and Pozzi at the turn of the century. The frequent failure of those operations marked a decline in this idea.

Bell³ espoused the theory that the condition was caused most commonly by hypoplasia of the uterus. Since then, due to the discovery that in many cases there was no demonstrable pathologic entity to account for the condition, and since many cures were effected by placebos, the idea that dysmenorrhea is largely psychosomatic has been proposed. Haman⁴ found by use of a Pelnor sensimeter that these women were more sensitive to pain. The management based upon this concept has been directed to improving the general welfare of the individual by exercises, psychotherapy, and hypnosis. The psychic factor should never be forgotten because the whole symptom-complex is bound around the subjective sensation of pain.

With the advances made in endocrine research, especially those of Bourne and Burn,⁵ Novak and Reynolds,⁶ Robson,⁷ Newton,⁸ and others,^{9, 10} that estrogens were associated with contractions of the uterus, while progesterone was accompanied by reduction of the contractions, several theories arose that dysmenorrhea was endocrine in origin. These were given a considerable blow when Sturgis and Albright¹¹ found that large doses of estrogens administered early in the cycle abolished ovulation, and that the subsequent period was quite

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†Ciba Pharmaceutical Products, Eli Lilly & Company, and Frederick Stearns & Company have generously supported these investigations. The Pitressin and Pitocin were purchased on the open market. The acetylcholine chloride was supplied by Merck & Company.

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painless. While there is some disagreement with these later findings, in general they are being substantiated by most observers. However, without the influence of endocrine secretions no menstruation is possible, so they must certainly play a major part in the normal and abnormal sequences of menstruation. Probably their chief role consists in setting the stage preparatory to a multitude of reactions which occur in the myoneural, vascular, and endometrial tissues. Macht and Lubin¹² demonstrated the presence of a toxic substance in the menstruum, blood, saliva, and skin secretions of patients immediately before and during menstruation. This substance, which they believe is chemically related to oxycholesterin, they called menotoxin. Smith and Smith¹³ state that dysmenorrhea is caused by a menstrual toxin which they have isolated from the endometrium immediately preceding and during menstruation. They hope it may be possible to develop a specific antibody which may be useful in treating dysmenorrhea.

Within the past decade there has been a growing appreciation of the importance of myometrial activity as determined by intrauterine balloon studies in the human being. Moir,¹⁴ Wilson and Kurzrok,^{15, 16} and Bickers¹⁷⁻¹⁹ have revived the theory that in some way muscular contractions, with possibly other associated factors, are at the root of the painful condition. Much of the work, however, has been done with imperfect techniques and, furthermore, the presence of the balloon as a foreign body within the uterus has caused undeniable and unavoidable criticism.

The classification of types of dysmenorrhea has been an inevitable accompaniment of the progress in knowledge, and has probably served a useful purpose. The separation most commonly given in textbooks is the division into primary and secondary; the former being those instances in which the disorder has originated at or soon after the onset of menstruation, and is generally unaccompanied by demonstrable alterations of the pelvic anatomy. The secondary type is associated with some detectable pathology, the onset of which may or may not coincide with the onset of dysmenorrhea. However, there is no pathologic condition of the pelvis which has been shown to be universally associated with painful periods. It is common knowledge that extensive pelvic pathology infections, fibromyomas, marked displacement or flexion of the uterus, and apparent complete fixation by adhesions may be associated with no pain whatsoever at the menstrual periods. Very likely the pelvic pathology, whatever it may be, is only one of a large group of contributory factors. Even membranous dysmenorrhea is misnamed, because in some instances, in which the larger part of the endometrium is shed in one sheet, there may be no pain. Dysmenorrhea is generally assumed to be the main symptom of endometriosis. Yet Counseller,²⁰ in a large series of cases, has shown that the periods were associated with pain in only 47 per cent of instances. Consequently, it is here suggested that this classification has outlived its usefulness and now should be abandoned.

In studying the individual case one is struck by the multiplicity of subjective symptoms making up the dysmenorrhea complex. Probably in no two individuals are they exactly alike. There can be as many differences in the individual pattern as there are combinations of a score of minor alterations of the abnormal sensations experienced by the patient, such as the variable locations and character of the pelvic pain, whether in the region of the uterus itself

or laterally; whether the pain is constant or intermittent, whether there is backache which radiates or not down the thighs or elsewhere. There may be epigastric distress, nausea with or without vomiting, lassitude, excessive nervous tension, and headache of variable onset, location, and duration. Many patients with dysmenorrhea bruise easily. It apparently is of more than chance occurrence that many of these patients are relatively free from constipation. The pattern in each patient seems to be quite constant, but may vary at alternating periods, possibly due to ovulation from one or the other ovary. The similarity of the pain to that of abortion or of labor is often graphically described by the patient and may be of definite significance. Apparently the cyclic phenomenon places additional stress upon the patient and exposes other subclinical conditions. If one is permitted liberal interpretation of the word dysmenorrhea, it could then be considered to cover any distress present during menses except, possibly, that of hypermenorrhea. Systems frequently involved include primarily the genital, but also the gastroenteric, nervous, cardiovascular, and urinary.

Every investigator must realize the tremendous psychologic influence of evaluating the entire subjective symptom of pain, and he must make all effort to as much objectivity as possible. Almost any type of therapy, even with apparently adequate controls, has been shown to be successful in the majority of patients in nearly any series studied. These treatments run the gamut of medical and surgical practices and, to name only a partial list, include psychotherapy, hypnosis, physical exercises, antispasmodics, sympathomimetics, analgesics, hypnotics, antihistamine drugs, placebos, anti-allergins, endocrines of all sorts—estrogen, progesterone, testosterone, pregnant mares serum, thyroid, surgical procedures, dilation of the cervix, stem pessaries, trachelorrhaphies, presacral sympathectomies. Since many of these treatments effect an “apparent” cure in the majority of cases, it is necessary to develop objective methods to evaluate the degree of the dysmenorrhea and its alleviation. The etiology of each portion of the symptom complex should be explored. Methods should be devised to duplicate dysmenorrhea symptoms in both normal and control patients, not only during menstruation, but also at other times. This leads to the study of the uterus itself and its adjacent and component parts including the nerve and muscle tissue and the vascular activities. This requires biochemical, physiological, and pharmacological techniques well known in the respective laboratories, and must be done by groups of clinicians and laboratory experts.

Many of the most productive leads in accumulating new facts in regard to the action of drugs, chemicals, and hormones have been obtained from animal work in laboratories of pharmacology and physiology. In some instances these observations have been applied directly to develop new theories in regard to the human uterus. This cannot be done safely until the work is repeated upon the human being, since the reactions may be markedly altered in the various species.

During the past twelve years at the University of Georgia School of Medicine extensive investigations of the human uterus have been conducted by the staff members of the Departments of Obstetrics and Gynecology, Pharmacol-

ogy, and Physiology. Pertinent studies upon various laboratory animals have been associated with similar investigations upon the human being. Using the Hamilton optical manometer^{21, 22} and very small single or multiple balloons inserted into the uterus, and with needles inserted into blood vessels, pressure changes even up to 400 mm. Hg may be recorded simultaneously, with as little as 0.01 c.c. of fluid alterations showing all changes to within $\frac{1}{200}$ second.²³⁻²⁵ This has permitted determination of exact intercontraction tone pressures which in some cases were as low as 2 mm. Hg. The system also permits exact measurements of the amount of distention of the uterine cavity.

The human uterus varies during the monthly cycle both in structure and irritability.²⁶ It has work to do, and its muscle tissue responds to stresses and loads in a manner similar to muscle tissue in other organs, such as the heart

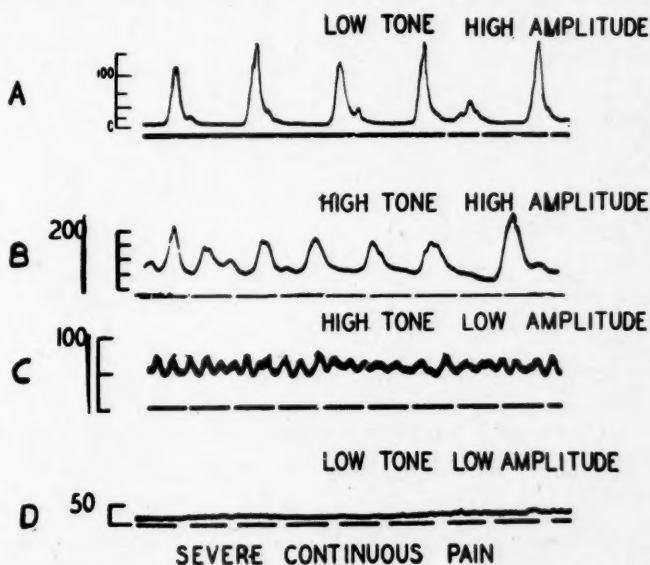


Fig. 1.—Human uterine pressure curves obtained during the first day of menses. The uterus is under a work load produced by distention of the intrauterine balloon. In all tracings time intervals of one minute are indicated on the base line, and the uterine pressures scale shows units of 50 mm. Hg unless indicated differently. The patients from whom the upper two tracings were obtained stated the abdominal distress was wavelike in nature; while those from whom the lower two tracings were obtained stated the abdominal pain was continuous and severe. Note the wavelike contractions on the upper two tracings and the nearly uniform pressure levels in the lower two tracings.

Fig. 1, A.—Patient, aged 25 years, para V, whose menstrual distress consists primarily of backache and legache with some low abdominal pains, intermittent in character and some headache. Her distress started after the delivery of her last pregnancy (twins) six years ago. During the illustrated pressure curves the abdominal pain appeared on the upstroke near 60 mm. Hg and lasted until the contraction curve was practically complete that is until the pressure had decreased to near 30 mm. Hg. The backache persisted and though it was markedly reduced in intensity, it did not completely disappear between contractions.

Fig. 1, B.—Patient, aged 27 years, para I, whose menstrual distress is severe, confines her to bed, and is relieved only by morphine. With every menses since menarche, the patient has experienced pain which quickly becomes intense. She complains of severe "doubling up" pains every two to four minutes superimposed upon a steady severe abdominal pain. She describes these pains as far more severe than those associated with childbirth. At the time this tracing was being recorded the menstrual distress was quite similar to that regularly present every month. The severe "doubling up" pains were experienced during each of the uterine pressure elevations and persisted on the downslope longer than the point corresponding to the time of their appearance on the upstroke.

Fig. 1, C.—Patient, aged 16 years, para 0, with severe steady abdominal distress. Note the absence of any large wavelike changes in uterine pressure, and that this patient experienced constant pain rather than intermittent pain.

Fig. 1, D.—Patient, aged 16 years, para 0. Note that severe continuous pain is present even though the uterine pressure is low. This is not typical, but has been observed in two patients who have painful menses.

and intestines. The balloons which we insert serve as foreign bodies resembling the menstrual debris. The uterus responds to this load of the distended balloon by attempting to expel it, but gauze packed against the cervix prevents this. Pressure curves show that organized (Fig. 1 *A*, 1 *B*) and disorganized (Fig. 1 *C*, 1 *D*) contractions and a mixture of these types (Fig. 1 *B*) occur. The disorganized or mixed type like those illustrated in Fig. 1 *B* and 1 *C* were observed more frequently in the patients who have dysmenorrhea, while those like Fig. 1 *A* were observed more commonly in the control patients. Yet, no particular type of tracings is always associated with dysmenorrhea.

Uterine pressures at which patients complain of pain vary a great deal. When contractions are organized, uterine discomfort occurs near 40 to 100 mm. Hg, and uterine distress appears near 140 to 180 mm. Hg. Low back pain, however, may occur during organized contractions which develops only 30 mm. Hg pressure. If the uterus is placed under a heavy load by additional distention of the balloons, organized contractions have developed a peak pressure of 340 mm. Hg in one dysmenorrhea patient. The average pressure in dysmenorrhea patients under these conditions was 160 mm. Hg, though 250 mm. Hg has been observed in several patients. It is interesting that during parturition the uterus develops maximal pressures ranging only from 40 to 90 mm. Hg.²³

During menstruation the abdominal pain may be intermittent or steady. In those patients where it is intermittent in nature, low uterine pressures were present between contractions, see Fig. 1 *A*. Contractions in such patients have been described as coordinated or organized.²⁵ Patients who developed steady severe low abdominal cramps generally showed uterine contractions with high intercontraction tone, see Fig. 1 *B* and 1 *C*. Where the menstrual distress includes severe steady abdominal pain and frequently recurring intense cramps or "doubling up" pain, tracings similar to that illustrated in 1 *B* were obtained and the patient complains of the "doubling up" pain during the wavelike elevations of uterine pressure. However, a definite latent period is apparently present since the pain persists further down on the descending slope than the point which corresponds to its site of appearance on the upstroke. This suggests that other factors such as blood circulation are important in the pain. In the presence of high tone (see Fig. 1 *B* and 1 *C*), pain always is severe at much lower pressures, often with pressures of 40 to 80 mm. Hg as has been shown by Moir,¹⁴ Wilson and Kurzrok,^{15, 16} and Bickers.¹⁷⁻¹⁹ However, as shown by Fig. 1 *D*, an occasional patient does suffer severe pain even with pressures associated with contractions possessing low amplitude and low tone. This observation that pain can be associated with uterine pressures of only 10 to 15 mm. Hg definitely differs from all of the previous reports.

Two impressive and revolutionary observations were that the characteristic pain could be produced in all of the twenty-five patients by the injection of pitressin, or by stretching of the uterus by increasing the fluid in the balloon²⁵ (Fig. 2). Pitressin evoked the characteristic dysmenorrhea symptoms of any particular patient including such remote effect as headache.²⁵ It was found that an intrauterine balloon was not necessary, though with its presence a smaller amount of pitressin would evoke the symptoms, especially when the balloon

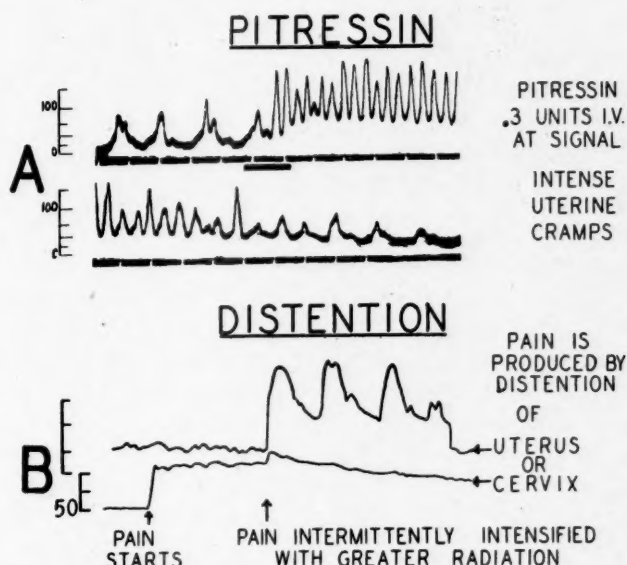


Fig. 2.—Injections of pitressin or distention of the uterus produced the characteristic symptoms of dysmenorrhea.

Fig. 2, A.—Uterine pressure curves from patient whose tracings are shown in Fig. 1, A, though these were recorded six hours later. Following the intravenous injections of 0.3 units of pitressin the patient complained of severe headache, backache, legaches, and intense uterine cramps and pain which became less severe after twenty to thirty minutes, but did not disappear until after receiving an analgesic after the elapse of one and one-half hours.

Fig. 2, B.—Uterine and cervical pressure tracings from a patient aged 27 years with dysmenorrhea since menarche. Menstrual distress includes severe headache, abdominal pain, and tenderness and, since the age of 18 years, "flooding" for one to nine days. Presacral nerve crush performed in 1941 afforded marked but incomplete relief of her menstrual pain. Estrogen and pregnandiol urine excretion and suction curettage indicate ovulation had occurred. Fluid added to or withdrawn from balloons at arrows. Note that pain was produced by adding 1/2 c.c. to the 1/2 c.c. already in the cervical balloon and intermittently intensified by adding 4 c.c. to the 1 c.c. already in the uterine balloon. Also note that the greater stretch upon the uterus was accompanied by a change from typical estrogenic to typical luteal contractions and that estrogenic type of contractions recurred when he stretch upon the uterus was reduced.

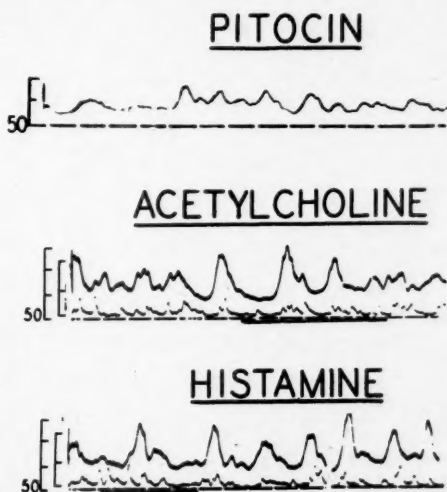


Fig. 3.—Tracings were obtained from same patient which supplied those in Fig. 1, A and Fig. 2, A; and were obtained five hours, three hours, and 2 hours before the injection of pitressin. Menstrual distress was not produced by the intravenous injection of 3 units of pitocin, 100 mg. of acetylcholine, nor 0.025 mg. of histamine, though patient stated she felt some activity low in the abdomen after the pitocin injection and some cutaneous warmth after each of the three drugs.

was distended.²⁶ These symptoms did not occur after the injection of corresponding or even larger quantities of pitocin (Fig. 3). In fact, pitocin generally reduced the distress after the initial transient painful effect. Comparison of Fig. 3 with Fig. 2 shows that pitocin, histamine, and acetylcholine cause less increase in uterine activity than that caused by pitressin; also the contractions tend to remain better organized. At the present time in the search for new drugs which might relieve dysmenorrhea, various laboratories are spending considerable time, effort, and funds in evaluating chemicals and drugs as spasmolytic agents against acetylcholine and histamine. In certain cases²⁸ the use of the terms neurogenic and myogenic spasmolytic action have been applied to these drugs when they reduced the action respectively of acetylcholine and histamine on the uterus. Yet, in attempting to reproduce the exact type of painful reaction, it was found that the complete menstrual pain was never elicited by acetylcholine or histamine intravenously injected at the rate to produce distressing side reactions. This was true whether balloons were or were not inserted into the uterus. This may explain the poor results of the antihistaminic and anticholinergic antispasmodics when used upon the severer types of dysmenorrhea.

Nulliparous patients as a group accommodate less distention of the balloon than was tolerated by parous patients.²⁵ The average nulliparous dysmenorrhea patient tolerated 3 to 5 c.c., while control nulliparas tolerated on an average 4 to 7 c.c., and multiparous dysmenorrhea patients tolerated 5 to 9 c.c. Bearing a child apparently increases the tolerance of the uterus to stretch by enlarging the uterus. This may account for the relief of menstrual distress after bearing the first child in some, but certainly not in all individuals. One nulliparous patient could not tolerate as small an amount as 0.4 c.c. of fluid within the balloon (balloon occupied a minimal space of 0.8 c.c.). Such limited tolerance to the presence of 1.2 c.c. could well explain the menstrual distress in this patient and in those patients with an infantile type of uterus where edema and engorgement alone without the menstrual debris could well stretch the uterus sufficiently so as to cause menstrual distress. In such patients even when muscular activity was normal in type and was expelling uterine contents properly, the patient would experience continual distress intermittently intensified with uterine contractions.

Records were obtained simultaneously from three balloons inserted at different levels into the uterus and from one balloon inserted into the cervix. The position of the balloons is illustrated in Fig. 4 where they were overdistended with sodium iodide solution in order to visualize them by X-rays. Uterine pressure curves are different at various levels within the uterus both during organized contractions, see Fig. 5, and during disorganized contractions. There is a rather low correlation between fundal and cervical contractions. The latter are generally shorter and more frequent, whereas the musculature in the dome is slow to contract and even slower to relax. Downward from the dome of the fundus the uterine muscles progressively contract faster and relax more completely. The fact that different pressures exist in different portions of the uterus during menses allow organized contractions to propel menstrual debris

downward and out of the cervical canal. Disorganized contractions or the development of a contraction ring, as was observed in one patient, may interfere with this milking action causing undue distention and pain in certain instances. Since different pressure curves are obtained from different parts of the uterus, single balloon tracings obtained from month to month may well differ from each other merely as a result of the location of the balloon, and may provide false ideas concerning drug action.

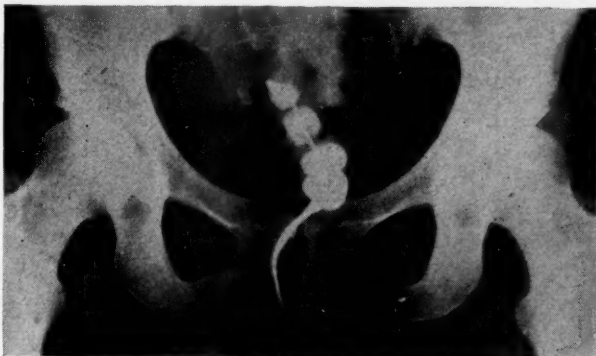


Fig. 4.—Roentgen visualization of four balloons inserted so as to record pressures simultaneously from the dome of the fundus, the main portion of the fundus, the lower uterine segment and the cervical canal. In this patient the balloons have been overdistended with 30 per cent solution of sodium iodide in order to obtain better visualization.

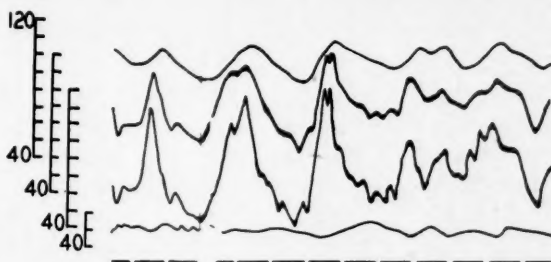


Fig. 5.—Multiple balloon tracings from the uterus of a patient aged 31 years with dysmenorrhea symptom-complex of steady low abdominal cramps with intermittent wavelike cramps. Note that pressure curves from different portions of the uterus differ from each other. Single balloon tracings obtained from month to month may well differ from each other merely as a result of the location of the balloon and thereby may lead to false ideas concerning drug action.

From the study to date it is justifiable to consider the menstruating uterus as functioning in a fashion similar to that in abortion or in labor with their respective puerperia, substantiating the idea that menstruation is an abortion of the decidual endometrium. Under load the myometrial action may become similar to that in abnormal types of labor.²⁷ The dysmenorrheic patients fall into loosely defined groups, some of whom are more or less true types such as the one described by Bickers with high pressure uterine contractions quite regular and accompanied by high intercontraction tones. These are the ones who respond well to spasmolytics such as magnesium ions which relieve the spasm. However, in many others there must be a multiplicity of factors besides the myometrial, all of which together produce the symptom complex. Spalding,

Main, and Patterson's²⁹ observations support this hypothesis. They reported dysmenorrhea like episodes in a patient who had congenital absence of the uterus which was replaced by muscular nodules at the proximal ends of the round ligaments. The painful periods occurred even after the surgical removal of the muscular nodes. Larkin³⁰ reported production of dysmenorrheal-like attacks in six women whose fundi had been removed. Other possible etiologic factors include: vascular congestion, inflammatory or cyclic edema, tissue or cellular fragility, vasoconstriction, and unusually low threshold for pain.

Studies now in progress show that during the premenstrual and menstrual periods the myometrium and blood vessels of some patients show a greater sensitivity to pitressin than was present during the late resting stage of the cycle. This heightened sensitivity also included the influence of pitressin upon water metabolism. A similar hypersensitivity to pitressin, acetylcholine, epinephrine, and histamine has been produced in rabbits, dogs, and cats by the administration of estrogens.³¹

These observations suggest the hypothesis that dysmenorrhea may result from a physiologic increase in sensitivity which varies in intensity and in type from patient to patient. This hypersensitivity may concern only the uterus or may involve other systems such as the gastroenteric, cardiovascular, and nervous systems, and thereby account for the particular dysmenorrhea symptom complex of a given patient. A tentative outline of the other factors contributing to dysmenorrhea is appended.

I. *Mechanical obstruction which may be caused by:* anatomic conditions such as juvenile type of uterus, cervical stenosis, malposition, fibroids, or scar tissue.

Infections where scar tissue, congestion, edema, and pus are factors.

Physiologic changes where excessive tissue fragility, membranous menstrual debris, cyclic edema and congestion of the uterus and tubes, and spasm producing contraction rings may be important contributory factors.

Obstruction also may occur in other systems since pylorospasm or cardiospasm are frequently observed immediately before and during menses in certain patients.

II. *Insufficient circulation secondary to:* cyclic edema and passive congestion, vasoconstriction, abnormal muscle activity, scar tissue, and anemia. The reproductive tract and the lumbar venous sinus generally are markedly effected but other areas such as the gastroenteric and urinary systems may also be influenced.

III. *Disorganized muscular activity or excessive pressures developed by organized contractions of the uterus or tubes secondary to:* menstrual debris, obstruction, an unusually small tolerance to distention of the uterus, nerve edema, high estrogen levels or unusual sensitivity to normal levels of estrogens.

IV. *Very low threshold for sensory impulses:* This may be the result of individual differences, excessive increase in irritability before and during menstruation, infection, presence of edema about nerves and nerve endings during the premenstrual and menstrual period, and/or presence of scar tissue. As a result uterine muscular response, pain perception, and vascular changes may be abnormally great.

V. *Other contributory factors include:* Excessive tissue fragility, emotional stress, menstrual toxins, vascular changes in the ovaries, and presence of other conditions such as allergy and intervertebral disc pathology.

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THE VALUE OF X-RAY STUDIES OF THE PELVIS IN OBSTETRICS*†

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IT HAS been observed that not infrequently obstetricians, in the management of their difficult cases, fail to avail themselves of the information to be gained from x-ray studies of the pelvis and fetal-pelvic relationship. This prompted the questionnaire, which was sent to every member of the South Atlantic Association, in an effort to find out just how often x-ray studies are used, what techniques are employed, and the value derived therefrom. Ninety-eight of the 122 questionnaires were answered. Five members limit their work to gynecology, thus leaving 93 questionnaires for analysis. Table I to IV show the results.

TABLE I.—INCIDENCE OF PELVIC X-RAY STUDIES

OBSTETRICIANS	PER CENT OF CASES
3	0
16 (18%)	Not stated
8 (9%)	1 or less
26 (29%)	2 to 5
15 (17%)	6 to 10
9 (10%)	11 to 20
7 (8%)	21 to 30
4 (4%)	40 to 60
5 (5%)	80 to 100
—	
90	

Incidence of Pelvic X-Ray Studies (Table I).—Three of the ninety-three obstetricians rarely, if ever, use x-ray studies. Sixteen fail to state the incidence, but it seems fair to assume that their incidence is between 1 to 10 per cent (1 to 5 per cent is probably more accurate), and for statistical purposes is so shown.

Eight of the reporting obstetricians use x-ray studies in 1 per cent or less of their cases; twenty-six in 2 to 5 per cent; fifteen in 6 to 10 per cent; nine in 11 to 20 per cent; seven in 21 to 30 per cent; four in 40 to 60 per cent; five in 80 to 100 per cent (including three who use x-ray in 100 per cent of their cases).

Combining the 1 to 5 per cent and 6 to 10 per cent groups, one finds that 49 (55 per cent) obstetricians employ x-ray studies in 1 to 10 per cent of their cases, and by including the sixteen obstetricians with unrecorded incidence the number becomes 65 (73 per cent). In other words, 73 per cent of the members of the South Atlantic Association, who answered the questionnaire, use pelvic x-ray studies in not more than 1 to 10 per cent of their cases. Furthermore, of the 73 per cent, twice as many use x-ray studies in 1 to 5 per cent of their cases as do those in the 6 to 10 per cent group!

*Read at the annual meeting of the South Atlantic Association of Obstetricians and Gynecologists, Savannah, Ga., Feb. 6 to 8, 1947.

†Based on questionnaire to the membership of the Association.

By way of comparison, at the New York Lying-In Hospital,¹ pelvic x-ray studies are made on 7.6 per cent of the clinic cases and 20.3 per cent of the private patients.

At the Sloane Hospital for Women,² approximately 20 per cent of the clinic cases and 30 per cent of the private patients have x-ray studies.

In my private cases, the incidence approximates 25 per cent.

TABLE II.—TIME X-RAY STUDIES MADE

Early in pregnancy	3
At or near term	13
At or near term and/or during labor	74
	—
	90

Time X-Ray Studies Made (Table II).—Three obstetricians prefer x-ray studies early in pregnancy and occasionally repeated later; thirteen at or near term; seventy-four at or near term and/or during labor.

As would be expected, most studies are made at or near term, and less frequently during labor, when the relationship between full-term fetus and pelvis can be shown.

TABLE III.—X-RAY TECHNIQUE

Thoms-Torpin	45
Ball	13
Caldwell-Moloy	7
Snow	2
Sussman	1
Walton	2
AP. and lateral	5
Combination of methods	5
Unknown	10
	—
	90

X-Ray Technique (Table III).—Forty-five obstetricians use the Thoms-Torpin method (including modifications); thirteen use the Ball technique; seven use Caldwell-Moloy; two use Snow; two use Walton; one uses Sussman; five use a combination of the various methods above; five use simply an antero-posterior and lateral film; ten do not know what technique is employed, being left entirely to the discretion of the radiologist or technician.

TABLE IV.—VALUE OF X-RAY STUDIES

Invaluable, or extremely valuable	15
Helpful	18
Occasional x-ray helpful	32
Questionable value	25
	—
	90

Value of X-Ray Studies (Table IV).—Fifteen obstetricians find pelvic x-ray studies to be invaluable, or extremely valuable; eighteen find them helpful; thirty-two find an occasional x-ray helpful; twenty-five find that x-ray studies are of very limited, or even questionable value.

In other words, approximately one-third of the ninety obstetricians find pelvic x-ray studies to be of real value, but only 50 per cent of this group use

x-ray as an important part of their obstetric armamentarium; one-third show a "lukewarm" interest in, and derive occasional benefit from these studies; the remaining one-third find little, if any, value in such studies (and have the lowest x-ray incidence!).

Discussion

It is not surprising to find that most of the obstetricians who rely on anteroposterior and lateral films alone, or who leave the choice of the film technique to the radiologist or technician, report little if any value derived therefrom. This is to be expected. Unfortunately, the technique and interpretation of pelvic radiography is not quite so simple. Many obstetricians have not been sufficiently interested to learn what a good technique consists of and what to expect from it. It must be remembered that the radiologist does not examine the patient. Therefore, his interpretation has to be correlated with the clinical findings, and for this reason best results are obtained when the obstetrician studies the films with the radiologist, or learns to read them himself. Allan Tuggle,³ radiologist of the Charlotte Memorial Hospital, has aptly expressed it when he said: "Accuracy of interpretation is dependent upon the skill and experience of the physician whether he be obstetrician or radiologist."

There are several methods of pelvic radiography which, in the hands of those who carefully carry out the originator's technique, are giving good results. In general, they range from the strictly quantitative, such as the Ball, to the qualitative, such as the Caldwell-Moloy, which stresses primarily the qualitative values, without much consideration of mathematically expressed diameters per se, through stereoscopic vision of the entire pelvis and fetal-pelvic relationship.

More recently the isometric method, which is really a combination of the quantitative and qualitative aspects of x-ray pelvimetry, has been described by Steele, Javert, and McLane.¹ McLane, however, has made an interesting statement: "I believe the qualitative method of Caldwell and Moloy is the best method we have for studying cephalopelvic disproportion, but you cannot sell it to the public. You must give measurements, you cannot sell an obstetrician relationships."

The replies received from the questionnaires seem to bear out McLane's statement. Only seven of ninety report using the qualitative method of Caldwell and Moloy. And yet there is considerable dissatisfaction on the part of many obstetricians with the other methods being used, as evidenced by the frequent complaint of the inadequacy of their x-ray studies. I am convinced that one reason why x-ray means so little to these obstetricians is that they think of it and use it only for measurements, and forget that information of greater importance than actual measurements is gained by studying the pelvis and fetal-pelvic relationship under stereoscopic vision, as originally stressed by Caldwell and Moloy. I thoroughly agree with D'Esopo⁴ when he says: "Personally, I feel somewhat lost when I try to evaluate the pelvis in terms of diameters. The stereoscopic view of the relationship between the head

and the pelvis gives a three-dimensional concept which permits structural visualization that greatly augments the information that we obtain by digital examination."

In my practice, I use the Caldwell-Moloy technique with an ordinary stereoscope instead of the precision stereoscope. No attempt is made to take any pelvic measurements, except the anteroposterior diameter (true conjugate) when desired. This is measured by means of a centimeter lead ruler which is placed between the thighs on the lateral film. Thus the ruler has the same distortion as the film in this plane and gives an accurate measurement. The lateral film is taken with the patient lying down. However, it is claimed⁵ that the standing lateral has advantages over the supine lateral, particularly since it aids in allowing gravity to force the head to the lowest level.

My interpretation of the films then, for the most part, is a qualitative one, i.e., a study of the architecture of the complete pelvis, and of the relationship between the fetal head and the pelvis at term or during labor.

It has been shown that it is almost impossible to take accurate pelvic inlet measurements by vaginal examination. Several investigators, i.e., Steele, Wing, and McLane,¹ Thoms,⁶ and Dickinson and Procter⁷ have checked the true conjugate by x-ray against the diagonal conjugate method clinically and found very little correlation between the two. McLane concluded that clinical measurements on the pelvic inlet have no value. Of even greater importance, however, is the study of 1,000 cases, by x-ray pelvimetry, by Steele and Javert,⁸ who found that clinical measurement of the anteroposterior diameter of the inlet will reveal only one-half of the truly contracted pelves.

Weinberg and Scadron,⁹ in a study of 350 cases x-rayed routinely ten days before term and the findings compared with the clinical examination, found that when both the clinical and x-ray prognosis agreed, the accuracy of prognosis was highest. When x-ray and clinical studies differed, x-ray prognosis was found to be three times as accurate as clinical prognosis.

Certainly x-ray gives a far more accurate impression of the shape and size of the pelvis, at all levels, than can be obtained from vaginal examinations alone. Frequently, x-ray simply confirms the findings from vaginal examination, in which case it is reassuring. However, there are many times when x-ray study reveals features in the pelvic architecture that one has missed entirely by vaginal examination. A good example is the size of the sacrosciatic notch or the shape and position of the sacrum. These factors may be of the greatest importance as regards the type of delivery anticipated, especially if it is to be operative.

Pelvic radiography should not, of course, take the place of careful vaginal examination. However, one should be aware of the limitations of, and at times erroneous impressions obtained from, vaginal examinations.

Answers to the questionnaires revealed the fear on the part of a number of obstetricians that the use of x-ray would lead to an increase in the cesarean section rate. However, this is not borne out by experience. For example, my cesarean rate averages 3.6 per cent. At the New Haven Hospital, from 1935

to 1944, the cesarean rate on the ward service was 3.2 per cent, and on the private service 9.6 per cent. X-ray studies were used on both groups and used routinely for primiparas in the ward service. Thoms¹⁰ states that: "From our somewhat extended experience, we have for some time been convinced that, while a knowledge of the true capacity of the bony pelvis as revealed by x-ray may increase the incidence of cesarean section as an operation of choice over the difficult forceps or breech extraction, it is equally true that the employment of the operation will be decreased in such cases as unengaged head where disproportion is suspected but, when subjected to roentgen examination, does not actually exist."

At the New York Hospital,¹ where x-rays were taken routinely on certain groups of cases over a period of three years, there was a decrease in the number of cesareans done for disproportion, and also a decrease in the gross fetal mortality.

Stander states: "As a result of x-ray pelvimetry, the total incidence of cesarean section may not be markedly decreased, but this operative procedure should be performed more frequently upon correct indications, thus decreasing the unnecessary ones, at least these should be done more often at the proper time, instead of too late to be consistent with the best welfare of both mother and child."

At the Boston City Hospital,¹¹ the incidence of cesarean section for cephalopelvic disproportion in primiparas was reduced by 50 per cent, without jeopardizing the mother or baby, after adoption of x-ray pelvimetry.

At Sloane Hospital for Women,² for the past five years the ward cesarean incidence has ranged from 3.3 to 3.8 per cent, and the private patients twice this per cent. X-ray has not increased the incidence of cesarean section, but its use has permitted application to the proper cases.

Moloy⁵ states: "... , in many instances, the information contributed by roentgenologic examinations has been a factor in saving fetal life. This is quite a far cry from criticisms offered in earlier years, that roentgenologic methods of examinations would result in a loss of skill in the use of our hands in obstetric maneuvers. I believe, on the contrary, an understanding of the varied mechanisms of labor and careful appreciation of the size of the pelvis and its shape has enabled us to perform correct maneuvers without the trial and error that frequently resulted in obstetric difficulty in the past."

Should pelvic x-ray studies be routine? Films on every primipara and on some multiparas is a desirable routine. However, it is not an actual necessity in the majority of cases, as a minimum of information can be obtained without it. The question of expense, as was so often referred to in the questionnaires, should not enter into the decision if x-ray study is thought to be indicated. The expense is not great, and surely the information frequently gained is worth "many fold" to the patient because of better obstetric results.

I would say that x-ray studies should be made in the following cases: (1) All patients with contracted pelves, questionable contraction, suspected disproportion, or with greatly abnormal architectural features, as revealed by vaginal examination; (2) all patients not previously x-rayed, whose labor is not progressing satisfactorily, unless one can be sure that no possibility of disproportion exists—if x-rayed previously, repeat x-rays during such a labor are at times indicated; (3) all patients with a history of difficult labor or

delivery in previous pregnancies; (4) all primiparas, and some multiparas, with abnormal presentations, such as breech, transverse, brow, etc.; (5) elderly primiparas unless the pelvis is obviously ample; (6) fractured pelvis, spinal and other deformities.

Questionnaires were answered by six of the seven medical schools located in the area of this association. Two schools report x-ray incidence of 5 per cent or less; one of 5 to 10 per cent; one of 60 per cent; one of 100; and one failed to give the incidence. This would indicate that not all of our schools are stressing the value of pelvic radiography to medical students and house staff. It is well to remember that it is primarily because some American medical schools have taken the lead, that many obstetricians throughout the country today have learned to derive a great deal of benefit from x-ray studies. As the interest in this valuable adjunct increases in all of our schools, so will the interest increase on the part of many members of this association.

Summary

1. Questionnaires were sent to every member of the South Atlantic Association of Obstetricians and Gynecologists in an effort to learn the incidence of pelvic x-ray studies, techniques employed, and the value derived therefrom. Ninety-three questionnaires were analyzed.

2. The pelvic x-ray incidence varies from less than 1 per cent to 100 per cent. Sixty-five (73 per cent) of the members who answered the questionnaire, have an incidence of 1 to 10 per cent, but twice as many (of the 73 per cent) use x-ray studies in 1 to 5 per cent of their cases as do those in the 6 to 10 per cent group.

3. Most x-ray studies are made at or near term, and less frequently during labor.

4. Forty-five employ the Thoms-Torpin x-ray technique, thirteen the Ball technique, seven the Caldwell-Moloy technique, and the rest a variety of techniques. Many members are dissatisfied with the particular technique they are using.

5. The author uses the Caldwell-Moloy technique with an ordinary stereoscope. A centimeter lead ruler, routinely placed on the lateral film, gives the true conjugate measurement, when it is desired. Caldwell-Moloy technique gives information of greater importance than actual measurements.

6. Approximately one-third of the members find pelvic x-ray studies to be of real value, but only 50 per cent of this group use x-ray as an important part of their obstetric armamentarium; one-third show a "lukewarm" interest in, and derive occasional benefit from, these studies; the remaining one-third find little, if any, value in such studies (and have the lowest x-ray incidence!).

7. Questionnaires answered by six of the seven medical schools located in the area of this association indicate that not all of these schools are stressing the value of pelvic radiography to medical students and house staff.

8. X-ray studies may confirm clinical findings, or may reveal pelvic architectural features undetected by vaginal examination. One should be aware of the limitations of vaginal examination.

9. Pelvic radiography does not increase the cesarean section incidence. Its use aids in application of cesarean section to the proper cases.

10. Routine employment of pelvic radiography for certain groups of cases is advocated.

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THE INCIDENCE OF PSYCHOSOMATIC DISEASE FROM A PRIVATE REFERRED GYNECOLOGIC PRACTICE*

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THE fundamental mechanism of functional disease has been appreciated only by the psychiatrists until recently. During the last decade emphasis has been placed on psychosomatic disorders. The practitioner now appreciates that symptoms of organic disease frequently appear as a result of emotional and psychologic disturbances. Such functional disorders actually create disability equal to that resulting from organic pathology. In some cases there are actual physical changes simulating organic lesions, i.e., the spastic colon, pseudocyesis and others.

The attitude of the public in regard to psychosomatic disorders, has changed under the stimulus of the wide publicity given to the war neuroses. Prior to this, psychoneurosis was considered an insulting term to the patient to whom it was applied. Often the implication of malingering was suggested by the diagnosis. Furthermore, until recently many medical schools have taught only the organized psychoses and have neglected the less dramatic functional disorders. Each department of these schools relegates the discussion of such disorders to psychiatric classes which are assigned only a small portion of the curriculum. In contrast, one school teaches that 80 per cent of the patients in the gastrointestinal clinic have functional complaints.

The diagnosis of psychosomatic disease rests upon two points:

1. The absence of any demonstrable organic pathology or a lesion sufficient to cause the patient's complaints.
2. The presence of a definite emotional problem grave enough to justify such a diagnosis.

The absence of a demonstrable pathologic lesion does not necessarily rule out a serious or fatal organic lesion which may not be detected by our present diagnostic methods. Occasionally all physicians are embarrassed when a patient under treatment for a presumed functional disease develops signs of a serious ailment. Each of the above criteria *must* be present for a diagnosis of psychosomatic disease.

Some physicians seek to explain all illnesses on an organic basis without considering that emotional factors may create misleading and bizarre symptom complexes; others overemphasize the psychologic background. The practitioner must keep in mind that both functional and organic problems occur in every practice, and must analyze each patient carefully from these points of

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view. Also it should be remembered that organic illness may give rise to fears which exaggerate the symptoms of the patient.

The incidence of psychosomatic problems encountered by the authors has been of interest, since our practice consists of a group of patients who are referred directly for consultation. Those patients not referred in the usual sense were the wives of physicians and others associated with the institution. Emotional problems were felt to be frequently responsible for many of the symptoms leading to consultation for the first group. For this reason, an analysis of the incidence of psychosomatic disease seemed worth while. The purpose of this paper is to call attention to this problem and to evaluate the frequency of its occurrence. Many of our patients had failed to respond elsewhere to adequate treatment of a pathologic lesion because an associated unsolved psychologic problem was present. Other patients were referred for various operative procedures which were unnecessary after solution of a fundamental emotional problem. It is interesting to note that some of them had one or more operations for the existing symptoms without relief.

Material

The patients studied consisted of the private office patients of two specialists in obstetrics and gynecology over a period of five years. For this reason, many acute and common obstetric and gynecologic complications do not appear, since the patients were sent directly into the hospital without first being seen in the office. The total number of patients subjected to analysis was 1,759. These patients ranged in age from 8 months to 82 years. All of the patients were referred and of the white race. Three major groups were recognized.

1. Group 1 were patients who presented sufficient diagnostic pathologic findings to account for their symptoms.
2. Group 2 had symptoms in excess of the physical findings.
3. Group 3 were patients characterized by numerous symptoms which could not be explained by any physical signs.

The following distribution of patients was found:

TABLE I. GENERAL DISTRIBUTION

GROUP	GYNECOLOGY	OBSTETRICS	TOTAL	PER CENT
1	853	338	1191	67.6
2	180	40	220	12.6
3	331	17	348	19.8
	1364 (76.6%)	395 (23.4%)	1759	100.0%

A total of 32.4 per cent fell into Groups 2 and 3 which was an index of the incidence of psychosomatic disease. For convenience the patients were further subdivided into certain categories, some of which will be defined and illustrated by a short case report.

Group 1 consists of those patients who had organic pathology to account fully for their symptoms. A total of 1,191 patients had clear-cut pathologic problems. Tables II and III list the diagnoses encountered in this group.

TABLE II. GYNECOLOGIC DISEASE

1. Endometrial dysfunction	183
2. Benign cervical lesions	124
3. Pelvic relaxation, displacement, and Fistulae	109
4. Primary dysmenorrhea	101
5. Vaginitis	100
6. Sterility	89
7. Fibromyomata uteri	70
8. Gynecologic check-up	68
9. Pelvic inflammatory disease	65
10. Pelvic malignancy	36
11. Menopausal syndrome	28
12. Benign ovarian lesions	23
13. Vulvitis	16
14. Bartholinitis and cyst	9
15. Midmenstrual pain	8
16. Premenstrual tension	7
17. Congenital anomalies	6
18. No disease or undiagnosed	90

TABLE III. OBSTETRIC DISEASE

1. Intrauterine pregnancy	161
2. Incomplete abortion	11
3. Ectopic pregnancy	6
4. Missed abortion	4
5. Habitual abortion	4
6. Septic abortion	3
7. Hydatidiform mole	2

Included in this group are 215 patients who had apparent gynecologic symptoms due to disease in other systems or gynecologic disease secondary to pathology in other organs. For this reason, a complete history and physical examination is a part of each consultation. For example, backaches are often the presenting complaint to the urologist, orthopedist, and gynecologist.

TABLE IV. OTHER DISEASES

1. Urologic disease	38
2. Orthopedic disease	20
3. Diseases of ear, nose, and throat	3
4. Neurologic diseases	6
5. Adhesions and painful scars	12
6. Dermatologic diseases	4
7. Exogenous obesity	34
8. Cardiovascular diseases	22
9. Benign gastrointestinal disease	18
10. Malignancy (extra-pelvic)	5
11. Endocrine	28
12. Hematologic	3
13. Diseases of the venous system	6
14. Pulmonary disease	5
15. Benign tumors	5
16. Infectious disease	5
17. Deficiency status	1

Group II included 220 patients whose complaints could not be clearly justified by the existing pathology. They are subdivided into Group A with mild and Group B with severe disproportion between the pathology and symptomatology. This difference is commonly due to emotional conflicts related to the pelvic disease, such as fear of loss of sexual function, cancer operation, or

even fear of death. Many of the patients improved strikingly shortly after the exact character of their illness is explained to them. Typical examples are illustrated by the following case records:

Group II A.—Mrs. J. G. W., NCBH No. 25837, aged 20 years. Patient complained of amenorrhea of nine months' duration. She also complained of general malaise, lassitude, headaches, and lower abdominal discomfort. Prior to the period of amenorrhea, she had a regular menstrual interval of twenty-nine to thirty days, with bleeding of four to five days' duration. She had reached menarche at 13 years of age, and her secondary sexual characteristics appeared in the usual order.

General physical examination revealed no gross abnormalities except the presence of a cyst of the right ovary approximately 4 cm. in diameter.

A tentative diagnosis of a corpus luteum cyst was made, and the patient was reassured. She reported three weeks after her initial examination that her symptoms had rapidly improved and that she felt entirely well. One month later she had a normal menstrual period, followed by two months of amenorrhea, with the recurrence of her original symptoms. Her symptoms again disappeared after reassurance.

She then resumed a normal menstrual cycle, which continued during three years of observation. The ovary returned to normal size and consistency under observation.

Group II B.—Mrs. A. L. C., NCBH No. 28716, aged 36 years. This patient had three major operations, an appendectomy, a nephrotomy for a pyonephrotic kidney, and a laparotomy for adhesions. She also had a dilatation and curettage and cauterization of the cervix and four additional hospital admissions. She had been treated by numerous physicians in her home community and had been to two medical diagnostic centers. Her complaints were myriad, but the principal ones were related to her abdomen and genitourinary system.

The gynecologic examination revealed no gross abnormality of the pelvis. The vaginal mucosa was slightly reddened, and fresh, wet preparations revealed the presence of *Trichomonas vaginalis* organisms.

The patient complained bitterly of profuse leucorrhea. She was seen on seven occasions during a two-year interval, and although each examination was made a full week after the patient's last douche, only a slight amount of secretion, slightly exceeding normal, was found in the vaginal vault. No other evidence of unusual leucorrhea was found.

Group III contained 348 patients who had symptoms in the absence of explanatory demonstrable pathology and, in addition, had emotional conflicts of sufficient severity to explain the complaints. They have been divided into nine somewhat arbitrary subgroups, using "The Standard Nomenclature of Disease" for diagnostic terminology. It is obvious that final diagnosis in these patients requires repeated interview and examination. Consultation with a psychiatrist was frequently refused because of the patient's conviction that pelvic pathology is present. These patients usually are beginning or have been on an endless round of medical consultations. The average course is a needless operation, treatment by a charlatan, or, occasionally, well directed psychiatric assistance. Many of the patients in this group have been endlessly treated for endocrine deficiency without avail. General diagnoses were made and are tabulated in Table V.

The following brief case reports illustrate some of the typical records in these subdivisions.

TABLE V. PSYCHIATRIC DISEASES

A. Psychosis	16
B. Psychoneurosis	130
C. Simple adult maladjustment	82
D. Dyspareunia	12
E. Phobias	59
F. Frigidity	32
G. Pruritis vulvae	10
H. Hyperemesis gravidarum	5
I. Miscellaneous	7

Group A. Psychosis.—Mrs. S. C. K., NCBH No. 7135. This patient was a 27-year-old para i, gravida ii, who had for the previous seven years suffered from what she described as "fainting spells." The consulting psychiatrist, however, stated that these were catatonic episodes. She was referred because of early pregnancy complicated by schizophrenia. Physical examination revealed early intrauterine pregnancy. There were numerous scars over the skin as a result of burns and injuries during her catatonic attacks. She was almost totally uncommunicative, her history being obtained entirely from her husband. Therapeutic hysterotomy and a tubal ligation were done through a Pfannenstiel incision. On her fifth postoperative day she suddenly appealed to the house staff not to be allowed to go home from the hospital. Her reason for this was that if she went home again, her father-in-law would insist upon sexual relations while her husband was still out in the fields. She further stated that her mother-in-law knew this, but both of them were afraid to say anything to the husband about it. When this request was not granted on the following day, she removed her dressing and pulled open the incision, which was resutured. Her story was investigated and found to be probably correct. At this point, however, the father-in-law stepped in and forced the husband to sign a release. She subsequently recovered in another hospital but is now in the same mental state.

Group B. Psychoneurosis.—Mrs. P. T. Y., NCBH No. 38652, aged 24 years. This patient was a buxom farm girl who took great pleasure in elucidating her many problems. She took a bath, a douche, and an enema each day. She had dyspareunia, which was becoming progressively worse every day. She was firmly convinced that coitus is a woman's worst experience, and frankly advised her husband of this fact after each sexual experience.

She had one child 5 years of age, and her prenatal course was complicated by vomiting to the last day. Her labor and delivery were normal, but her lurid description of this process was astounding.

Her menstrual history was equally remarkable with vaginal bleeding occurring whenever she was nervous, a pint of black blood gushing from the vagina on occasions, large pieces of red flesh passing at times, and she was bedridden with pain a minimum of forty-eight hours each month.

The patient had equally dramatic symptoms referable to every major system, but no organic pathology could be demonstrated by any available method.

Group C. Simple Adult Maladjustment.—Mrs. A. D. H., NCBH No. 54512, Mrs. W. W. B., NCBH No. 30290, and Miss V. A. D., NCBH No. 38925. These three patients were sisters presenting the same basic problem. The eldest was 34 years of age when first seen, with the chief complaint of sterility. On investigating her history further she confessed that at the age of 16 years she had had intercourse with a number of different men and had apparently developed an acute gonorrheal infection. She continued this sexual promiscuity until she was married at the age of 23 years, but states that she is now loyal to her husband.

Examination revealed a fixed retroflexion with thickening in both adnexal regions. Air studies and a salpingogram revealed occlusion of the tubes. She subsequently returned with the complaint of indigestion, nausea, vomiting, dizziness, and numerous other aches and pains. The internist who saw the patient did not know of her previous visit and felt that her difficulty was of a functional nature and treated her accordingly.

The second patient was 31 years of age, who was first seen because of vaginal discharge and arthritis. This discharge occurred prior to her marriage. She admitted to premarital intercourse of many years' duration. She was subsequently treated for arthritis of gonococcal origin, the organism being cultured after several tries from the vaginal discharge. Following her first hospital stay she had a criminal abortion, her husband being overseas. Her arthritis gradually improved with occasional flare-up. She has now left for a more favorable climate, and on last record was said to have been well.

The youngest sister was 21 years of age and single. Her chief complaint consisted of amenorrhea, leucorrhea, and loss of weight. She, too, gave the history of frequent intercourse since her menarche and stated that the man with whom she had been having intercourse recently was planning to marry her soon. Pelvic findings were questionable so that a Friedman test was carried out, which was found to be positive. She then stated that she was going to get married immediately and was not seen for two months. When she returned, it was for a check-up following a criminal abortion.

Group D. Dyspareunia.—Mrs. L. M. L., NCBH No. 31480. This patient was 34 years old and was married three years and divorced, and she had been remarried for one and one-half years at the time she was seen. She stated that her sexual relationships in both marriages were extremely painful and unsatisfactory. She described the pain as being on intromission as well as throughout the whole sexual act, and following intercourse continuous low abdominal pain with nausea and vomiting. Examination showed a perfectly normal pelvis with marked spasm of the pelvic floor muscles. This spasm could be relaxed by persuasion, which was frequently necessary during the examination. She returned later with the complaints of dysmenorrhea, et cetera, announcing that she could no longer stand the pain associated with intercourse and had separated from her second husband for that reason.

Group E. Phobias.—Mrs. B. E. H., NCBH No. 55233, aged 34 years. Her chief complaint was that life was not worth living and in addition had some complaints referable to practically every major system of the body. Further questioning revealed frigidity as an outstanding complaint.

The patient had been married for eighteen years. Her sexual responses were normal early in her marriage, with full orgasm occurring after the first three months of marriage. She was married when she was 15 years of age, and stated that her husband took advantage of her and that her choice of marriage partner was not a wise one. Her first child was born when she 15 years old and weighed 12 pounds. She had a very hard labor, two subsequent normal pregnancies, and several abortions.

Her husband is 43 years of age, inattentive, and does not understand her at all. They were staying together only because of the children. They practiced coitus interruptus for contraception, and she was in constant terror of conceiving again. Her indulgence in coitus was purely from the point of view that it was a marital duty.

She was intelligent and realized that her frigidity began after she had developed the phobia about the pregnancy, and all of her other complaints appeared subsequent to this problem. All of the usual diagnostic methods revealed no pathology.

Group F. Frigidity.—Mrs. B. F. F., NCBH No. 31437, aged 32 years. Patient complained that since the delivery of her baby she has had a progressive loss of libido, which has been closely correlated with diminishing sexual responses until sexual anesthesia is now present.

Shortly before the patient became pregnant, she learned that her husband had had a diagnosis of a congenital syphilitic infection made during his childhood. Shortly after their marriage it was determined on good authority that such an infection had never existed. The patient felt that her husband had been dishonest since he had not told her of this questionable syphilitic infection prior to their marriage. The emotional conflict resulting from this problem reached a point of crisis with the delivery of her baby, since during the entire pregnancy she has brooded over the possibility that her child might be deformed or might have some manifestation of this disease. Each day she looked for some evidence of syphilis in the child after its delivery and found herself constantly watching for some sign of a venereal disease in her husband. She was an intelligent woman and realized that this was directly related to her frigidity and had actually resulted in sexual aversion. No demonstrable pathology was present to account for numerous symptoms referable to every major system.

The patients were analyzed statistically from four viewpoints, the first of which was distribution according to age. This may be seen in Table VI. No significant factors were noted except the expected preponderance of patients in the active sexual life, i.e., 20 to 50 years (84 per cent).

TABLE VI. AGE DISTRIBUTION

	GROUP 1	GROUP 2	GROUP 3	TOTAL	PER CENT
0-20	100	18	30	148	8.5
21-30	521	101	132	754	43.0
31-40	330	62	116	508	28.0
41-50	153	33	49	235	13.0
50 and over	82	28	4	114	7.5
	1191	220	348	1759	100.0%

Secondly, an effort was made to determine any effect of occupation on the distribution of the patients. The occupational distribution of the patients is illustrated by Table VII. Again there is no conclusive evidence that occupation has any relationship to psychosomatic disease.

TABLE VII. OCCUPATION

	GROUP 1	GROUP 2	GROUP 3	TOTAL	PER CENT
Housewife	829	141	234	1204	69.5
Business	119	27	41	187	10.4
Professional	111	23	18	152	8.5
Industrial	65	19	21	105	5.7
No occupation	36	4	19	59	3.2
Student	31	6	15	52	2.7
	1191	220	348	1759	100.0%

The third analysis involved previous operations to which the patient had been subjected, and Table VIII is a breakdown of these figures. There is in the preceding table a definite tendency toward an increased number of previous operations in groups 2 and 3.

TABLE VIII. PREVIOUS OPERATIONS

	GROUP 1	GROUP 2	GROUP 3	TOTAL	PER CENT
0	1093	173	279	1545	88.0
1	80	27	44	151	8.4
2	11	19	19	49	2.8
3 and over	7	1	6	14	0.8
	1191	220	348	1759	100.0%

The final analysis dealt with the ultimate disposition of the patient which may be seen from Table IX. The figures in Table IX reveal that in general management of a patient was largely medical, since 76 per cent were handled accordingly. Dilatation and curettage and treatment of cervical lesions are included in the surgical procedures. The only psychiatric referrals were in group 3. In spite of the large number of patients in this group (348), only 25 would accept psychiatric care. We feel that this is due to the number of pelvic complaints based upon psychogenic factors.

TABLE IX. DISPOSITION

	GROUP 1	GROUP 2	GROUP 3	TOTAL	PER CENT
Medical	891	182	294	1367	76.0
Surgical	300	38	29	367	21.7
Psychiatric	0	0	25	25	2.3
	1191	220	348	1759	100.0%

Discussion

Whereas from the preceding figures psychosomatic disease is certainly not predominant, it is still a common phenomenon in gynecologic practice. A total of 568 patients, one-third of all of the patients exhibited some emotional disturbance. This figure is not as high as in some other specialties, but is still sufficient to demand attention. These phenomena occur more frequently in association with certain physiologic functions of the female, which are marital function and childbearing. Ignorance and fear seem to be the most important contributing factors. In general, the analysis revealed that there is little specific information in regard to the etiology of psychogenic disease in the preceding statistics.

Conclusion

1. The incidence of psychosomatic disease in a referred gynecologic practice is approximately 33 per cent.

AN ANALYSIS OF 416 CONSECUTIVE CESAREAN SECTIONS*

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AN ANALYSIS OF 416 CONSECUTIVE CESAREAN SECTIONS*

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THE purpose of this presentation is to analyze critically a consecutive series of 416 cesarean sections which we have done during a twelve-year period from Jan. 1, 1935, through Dec. 31, 1946. We primarily are trying to evaluate our results; inasfar as they apply to us, to determine the results regarding mortality, morbidity, and fetal deaths. Maternal mortality, preventable stillbirths, and neonatal death statistics have steadily improved during the past twelve years, but as long as some deaths are preventable this condition cannot be regarded as satisfactory. We are aware that cesarean section is regarded by many as a large contributor to maternal mortality, and this is probably correct under certain conditions; however, we believe that the study of these cases may throw some light on this subject to the contrary.

In this study we have divided the 416 cesareans under consideration into two groups. The first group of 275 cases are patients who came directly to us as private patients, not referred by any physician, or were referred early in pregnancy. Many obviously came to us because they had undergone previous obstetric difficulty; others anticipated trouble and sought special care; and still others had been under our care during previous pregnancies. The important fact is that we were able to give what we consider good prenatal study before the advent of labor.

The second group consists of 141 patients referred to us by another physician or clinic, either late in pregnancy, in labor, or the emergency of the case had already existed. Many of the patients were referred during the pregnancy because major obstetric difficulty had been anticipated. Many received little or no prenatal care, and some received good prenatal care by the attending referring physician. The important fact is that we were not able to study the majority of this group before the advent of labor.

Table I shows the distribution of cases, the number of deliveries, personal cases, and referred cases from 1935 to 1946 inclusive.

Table II indicates that in 3,935 deliveries there were 416 sections, or 10.5 per cent. There were 275 personal cases in 3,935 deliveries, or 6.9 per cent; 141 referred cases in 3,935 deliveries, or 3.6 per cent. Of the 416 sections, 141 were referred cases, or 34.3 per cent.

*Read at the annual meeting of the South Atlantic Association of Obstetricians and Gynecologists, Savannah, Ga., Feb. 6 to 8, 1947.

TABLE I. CESAREAN SECTIONS—1935 TO 1946 INCLUSIVE

YEAR	CASES	DELIVERIES	OUR CASES	REFERRED CASES
1935	10	152	7	3
1936	13	165	10	3
1937	13	149	10	3
1938	16	142	11	5
1939	25	181	15	10
1940	24	250	13	11
1941	40	314	23	17
1942	38	455	30	8
1943	52	543	30	22
1944	56	520	41	15
1945	65	482	48	17
1946	65	582	37	27
	416	3935	275	141

TABLE II. CESAREAN SECTIONS IN 3,935 DELIVERIES

Total	416 in 3,935—10.5%
(Referred	141 in 3,935— 3.6)
Personal	275 in 3,935— 6.9)
34.3 per cent of sections referred	

Disproportion (211 cases) provides the largest number both in the personal group (138) and the referred (73) group. We recognize that a wide difference of opinion exists as to what constitutes disproportion. We believe that x-ray study of all of these cases has no doubt increased the number of sections, but in so doing has increased the proper application of cesarean section. We believe that *many* could have been delivered vaginally with or without x-ray study. X-ray has been of untold value in giving information which would cast suspicion as to the outcome of the labor. We employ x-ray diagnosis as an aid in determining the various degrees of disproportion, including contracted midpelvis and outlet, and designating in some cases the position of the presenting part. We use the x-ray extensively in estimating maturity of the fetus, the location of the placenta, number of babies, and detection of malformation of fetal skeleton. We believe that this plan has eliminated severe complications associated with prolonged labor, uterine inertia, and hemorrhage, which have contributed so largely to both mortality and morbidity of the mother and death of the child.

During the past three years (thirty-six months) we have averaged 18.2 x-ray pelvimetries per month, or 657 x-ray pelvimetries in 1,584 deliveries, which is 41.5 per cent of all deliveries in the past three years.

We have used for the past six years the figures outlined by Snow in his book as a working basis in helping us decide the termination of the pregnancy.

Placenta Previa and Premature Separation of Placenta.—A total of 61 cases come under this heading. We do not follow the plan of doing sections on all placenta previas, nor do we section all abruptio placentas. X-ray has given us great help as an adjunct in diagnosis of placenta previa. We section all central placenta previas. X-ray has often picked up cases of placenta previa before bleeding began, and has accounted for some soft parts dystocia. Some cases of marginal and lateral placenta previa were sectioned because of the amount of bleeding and the condition of the cervix. We use a similar plan for premature separation of the placenta. To increase the gestation and viability of the baby, we have kept selected cases of placenta previa in bed in the hos-

TABLE III. INDICATIONS

<i>(Our Cases)</i>			
Disproportion	93	Previous section	8
Disproportion and previous section	53	Previous section, classical	2
Disproportion and breech	13	Previous section and transverse lie	1
Disproportion and difficult previous labor	8	Previous section and breech	2
Disproportion and cervical dystocia	3	Previous section and toxemia	1
Disproportion and uterine inertia	3	Placenta previa, centralis	8
Disproportion and face	3	Placenta previa, lateralis	4
Disproportion and placenta previa, lateralis	3	Placenta previa, marginalis	11
Disproportion and placenta previa, marginalis	2	Premature separation of placenta	9
Disproportion and transverse lie	2	Breech and uterine inertia	4
Disproportion and premature separation of Placenta	1	Breech and previous stillborn	1
Disproportion and pre-eclampsia	1	Breech and prolonged sterility	1
Disproportion and rectovaginal fistula	1	Breech and subluxation of pubis	1
Disproportion and tuberculous pelvic bone	1	Breech and cervical dystocia	1
Fibroids	4	Shoulder presentation	1
Face	3	Transverse lie	1
Repaired 3d degree laceration	3	Elective	1
Elderly primipara	3	Male pelvis (endocrine)	1
Pre-eclampsia	3	Prolapsed cord	1
Double uterus	2	Repaired vesicovaginal fistula	1
Malformed pelvic inlet	2	Myocarditis mitral stenosis	1
Cervical dystocia	2	Eclampsia	1
Stenosis cervix post-radium	1	Stenosis of cervix	1
<i>(Referred Cases)</i>			
Disproportion	44	Placenta previa, centralis	7
Disproportion and previous cesarean section	15	Placenta previa, marginalis	5
Disproportion and previous difficult labor	9	Placenta previa, lateralis	2
Disproportion and Breech	4	Placenta and to sterilize	1
Disproportion and eclampsia	2	Premature separation of placenta	6
Disproportion and uterine inertia	2	Previous section	3
Disproportion and elderly primipara	2	Previous section and impending rupture	2
Disproportional and marginal placenta previa	2	Previous section and nephritic toxemia	1
Disproportion and toxemia	1	Transverse lie	6
Disproportion and prolapsed cord	1	Eclampsia	3
Face	2	Pre-eclampsia	1
Fibroids	2	Pre-eclampsia and P.O. cervical stenosis	1
Cervical dystocia	2	Pre-eclampsia and breech	1
Breech and pelvic tumor	1	Pre-eclampsia and uterine inertia	1
Nephritic toxemia	1	Pelvic kidney	1
Double uterus	1	Failure of head to engage	1
Ovarian tumor and bleeding vagina	1	Encephalitis and sterilization	1
Ovarian pregnancy at term	1	Carcinoma cervix	1
		Multiple sclerosis and fibroids	1
		Diabetes	1
		Anencephalic	1
		Elective, twins	1

Condensed Indications

	OUR CASES	REFERRED CASES
Disproportion	138	73
Previous section	67	21
Placenta previa	28	17
Abruptio placenta	10	6
Breech	8	0
Fibroids	4	2
Toxemia	4	8
Cervical dystocia	4	2
Vaginal repairs	4	0
Elderly primipara	3	0
Miscellaneous	5	12
	275	141

TABLE IV. VARIATIONS IN PELVIC MEASUREMENTS

		SMALL	MEDIUM	LARGE
Inlet	A.P.	Below 10.5	10.5 to 11.5	Above 11.5
	Tr.	Below 11.5	11.5 to 12.5	Above 12.5
Mid-pelvis	Total	Below 22.0	22.0 to 24.0	Above 24.0
	A.P.	Below 11.0	11.0 to 12.0	Above 12.0
	B.I.	Below 10.0	10.0 to 11.0	Above 11.0
	Total	Below 21.0	21.0 to 23.0	Above 23.0
Outlet	P.S.	Below 6.5	6.5 to 8.0	Above 8.0
	B.T.	Below 9.5	9.5 to 10.5	Above 10.5
	Total	Below 16.0	16.0 to 18.5	Above 18.5

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TABLE V. TYPES OF SECTIONS

	OUR CASES	REFERRED CASES	PER CENT
Munro-Kerr	240	115 }	93.7
Beck	23	12 }	
Porro	5	5	2.3
Low classical	4	1 }	2.1
Classical	1	3 }	
Water's	1	2	.7
Smith's exclusion	1		.2
Post mortem		2	.5
Ovarian term		1	.2
Total	275	141	100%

TABLE VI. OTHER SURGERY

	OUR CASES	REFERRED CASES
Pomeroy sterilization	21	14
Madlener	4	6
Cornual resection	3	
Myomectomy	3	1
Umbilical hernia	2	
Uterine polyp	1	
Repair bladder	1	
Repair intestine	1	
Taking down Coffey suspension	1	
Salpingo-oöphorectomy, right		1
Salpingo-oöphorectomy, left		1

pital under close observation for several weeks, provided hemorrhage did not drive us to active interference.

Eclampsia, Pre-Eclampsia, Toxemia.—A small group (12 patients) of these patients were delivered by cesarean section. We never consider eclampsia and/or pre-eclampsia as an indication for section; rather, we use section in selected cases as the method of terminating the pregnancy, and then only when adequately treated. We prefer section under local anesthesia—at least without inhalation anesthesia—in those patients in whom the cervix is thick, hard, and undilated, or if disproportion exists.

Ninety-three and seven-tenths per cent, or 390, of the 416 sections have been cervical sections; 2.3 per cent, or 10, of the 416 sections have been Porro sections; 2.1 per cent, or 9 cases, of the 416 have been classical; 0.7 per cent, or 3, of the 416 have been Water's extraperitoneal type; 0.2 per cent, or 1, of the 416 has been Smith exclusion type; 0.5 per cent, or 2 cases, have been post-mortem sections; and 0.2 per cent, or 1, of the 416 was full-term ovarian preg-

nancy. Actually, both Water's and Smith sections are cervical in type so that 394 of the 416 sections, or 94.5 per cent, were cervical.

In addition to the sections, we also did a minimal amount of other surgery (see chart), chief of which was for sterilization. The Pomeroy type was used thirty-five times, the Madlener ten times, and cornual resection three times, giving a total of forty-eight sterilizations, or 11.5 per cent.

Morbidity.—Using the standard morbidity requirements of the American College of Surgeons, there were 36 of our cases, or 13.1 per cent, morbid, and 21 of the referred cases, or 14.6 per cent, morbid.

TABLE VII. TRIAL LABOR

Our cases	58	21.1%
Referred cases	32	22.3%
Total	90	21.5%

TABLE VIII. MORBIDITY

	OUR CASES	REFERRED CASES
Postoperative reaction:	14	3
Postoperative reaction and transfusion	1	1
Postoperative reaction and pyelitis	1	
Postoperative reaction and anemia	1	
Postoperative reaction and sapremia	2	
Pyelitis (one with anemia)		5
Mastitis (one with anemia)		2
Hemorrhage (with anemia)		1
Anemia and transfusion	1	
Pneumonia	1	
Mastitis	2	
Mastitis pneumonitis and sulfonamides	1	
Pyelitis	4	
Sapremia	3	3
Sapremia and mastitis	1	
Sapremia and pyelitis	1	1
Sapremia and retained lochia		1
Sapremia and transfusion		1
Thrombophlebitis: Iliofemoral		1
Acute phlebitis		1
Acute cystitis and syphilis		1
Anemia	1	
Total	36	21
Percentages	13.1%	14.6%

Fetal Mortality.—In the Personal group of 275 sections we lost sixteen babies, which is 5.8 per cent, an uncorrected fetal mortality. Twelve were neonatal deaths, and four stillborn. It is interesting to note that eleven of the sixteen babies were lost because of placenta previa or premature separation of the placenta.

In the referred group of 141 sections we lost 20 babies, or an uncorrected fetal mortality of 14 per cent. Thirteen were neonatal deaths and seven were stillborn. Here again we note that nine of the twenty babies were lost because of hemorrhage in the mother. Twenty of the thirty-six fetal deaths were due to either placenta previa or premature separation of the placenta. There were eleven full-term babies lost in the thirty-six deaths; six were in our cases and five in the referred group. The uncorrected fetal mortality of 36 deaths in 416 sections is 8.6 per cent.

Discussion of Maternal Mortality.—In 3,935 deliveries during this twelve-year period we had nine maternal deaths, six were cesarean section deaths,

TABLE IX. FETAL DEATHS—STILLBORN AND PREMATURE

YEAR	OUR CASES			REFERRED CASES		
	FETAL DEATH	OBSTETRIC INDICATION	SECTION	FETAL DEATH	OBSTETRIC INDICATION	SECTION
1935	Still-born	Premature separation of placenta. Full term	Porro			
	Premature	Placenta previa, central; 8 months; 4 lbs.; lived 3 days	Beck			
1936				Premature 24 weeks	Right ovarian tumor; ruptured membranes	Beck
				Premature	Nephritic toxemia 7 months 1 week; 3 lbs. 1 oz.; died in 4 hours	Munro-Kerr
				Premature	Placenta previa, central; 7½ months; died premature; 2 lbs. 14 oz.	Beck
1937	Premature	Myocarditis mitral stenosis; lived 10 hours; 3 lbs. 6 oz., atelectasis, patent foramen ovale	Munro-Kerr	Still-born	Premature separation of placenta; full term	Munro-Kerr
	Premature	Placenta previa, marginal; 8 months	Beck			
1938	Premature	Central placenta previa; 6½ months; weight not given	Beck			
	Premature	Central placenta previa; 6 months	Low Classical			
1939				Still-born	Premature separation of placenta; 8 months	Porro
				Still-born	Eclampsia; 8 months	Post mortem
1940						
1941				Still-born	Premature separation of placenta; pre-eclampsia; full term	Munro-Kerr
				Full term	Transverse lie and fibroids; died, atelectasis	Porro
				Premature	Placenta previa, central; 7 months; lived 12 hours	Beck
1942						
1943	Still-born	Premature separation of placenta; 8½ months	Munro-Kerr	Still-born	Hydrops of baby; 7½ months; fetal erythroblastosis	Munro-Kerr
	Still-born	Premature separation of placenta; 8 months	Munro-Kerr	Premature	Eclampsia and pre-eclampsia; 6 months; lived 4 hours	Beck
				Premature	Placenta previa; marginal; 7 months circulatory collapse; 3 lbs. ½ oz.	Munro-Kerr

TABLE IX—CONT'D

YEAR	OUR CASES			REFERRED CASES		
	FETAL DEATH	OBSTETRIC INDICATION	SECTION	FETAL DEATH	OBSTETRIC INDICATION	SECTION
1944	Full term	Disproportion and previous section; congenital absence of esophagus; 6 lbs. 5 oz.	Munro-Kerr	Premature	Placenta previa, lateral; 7½ months; 4 lbs. 6 oz.; lived 8 hours	Munro-Kerr
	Full term	Disproportion; died first day; 5 lbs. 4 oz.	Munro-Kerr	Still-born	Anencephalic; placenta previa	Munro-Kerr
	Premature	Placenta previa; central; 7 months; 3 lbs. 10 oz.	Classical			
	Still-born	Premature placenta previa; central; 6 months	Munro-Kerr			
1945	Premature	Placenta previa, marginal; 7½ months; died 3rd day; 3 lbs. 3 oz.	Munro-Kerr	Premature	Carcinoma cervix; 6½ months	Classical
	Full term	Cervical dystocia; cerebral injury; 5 lbs. 12 oz.	Munro-Kerr	Premature	Impending rupture of uterus; 8 months	Munro-Kerr
	Premature	Double uterus; 6½ months; died in several hours	Classical	Premature	Hydrops; fetal erythroblastosis; 6½ months	Beck
				Premature	Placenta previa, marginal; 6½ months; 2 lbs. 7 oz.	Munro-Kerr
1946	Premature	Premature separation of placenta; 6 months; lived 12 hours	Beck	Still-born	Anencephalic; 7 months	Munro-Kerr

TABLE X. FETAL DEATHS, OUR CASES (1935 TO 1946)

<i>Stillborn Premature</i>	
Placenta previa	1
<i>Stillborn Term</i>	
Premature separation of placenta	3
<i>Premature</i>	
Placenta previa	6
Premature separation of placenta	1
Double uterus	1
Myocarditis in mother	1
<i>Full Term</i>	
Congenital absence of esophagus	1
Cerebral injury	1
Cause not recorded	1
	16

and three were noncesarean section deaths. Of the nine deaths, two were in our personal group and seven were in the referred group. In the six cesarean deaths four were in the referred group. There were two deaths in our personal group and both were cesarean deaths.

The cesarean deaths include two postmortem sections which we include in this report for completeness of review, but actually we feel they have little to offer to the study.

TABLE XI. FETAL DEATHS, REFERRED CASES (1935 TO 1946)

<i>Stillborn Premature</i>	
Erythroblastosis fetalis	1
Anencephalic	2
<i>Stillborn Term</i>	
Premature separation of placenta	3
Eclampsia	1
<i>Premature</i>	
Placenta previa	6
Ovarian tumor in mother	1
Nephritic toxemia	1
Eclampsia	1
Carcinoma cervix	1
Impending rupture of uterus	1
Erythroblastosis fetalis	1
<i>Full Term</i>	
Atelectasis	1
	20

TABLE XII. INFANT MORTALITY IN 416 SECTIONS (1935 TO 1946)

	PERSONAL	PER CENT	REFERRED	PER CENT	TOTAL	PER CENT
Neonatal Deaths						
Premature	9		12		21	5.00
Term	3		1		4	0.96
Total	12	4.4	13	9.1	25	6.00
Stillborn						
Premature	1		3		4	0.90
Term	3		4		7	1.70
Total	4	1.4	7	4.9	11	2.60
Total	16	5.8	20	14.0	36	8.60

The six cesarean deaths are reported as follows:

CASE 1.—A. L. B., December, 1937; referred case; para i.

Indication: Eclampsia and pre-eclampsia treated four days. Two medical consultants.

Type of Section: Munro-Kerr low flap.

Baby: 3 lbs. 8 oz. Lived.

Death in twenty-four hours, severe toxemia. No prenatal care.

CASE 2.—L. J., January, 1937; referred case; para iii.

Indication: Premature separation of placenta. Pre-eclamptic.

Type of Section: Munro-Kerr low flap.

Baby: Dead in uterus.

Death in five hours after section, of hemorrhage and toxemia. No prenatal care.

CASE 3.—E. T., December, 1938; our case; para iv; weight 245 pounds.

Indication: Three previous difficult forceps deliveries; contracted pelvis; treated pre-eclampsia; in labor several hours.

Type of Section: Beck low flap.

Baby: Lived.

Death on eighth day, of sepsis, acute suppurative endometritis; peritonitis; miliary abscesses. Good prenatal care.

CASE 4.—J. M. B., July, 1939; referred case; para iii.

Indication: Pre-eclampsia; breech; difficult first labor.

Type of Section: Post mortem. Patient treated for one week before section; transfused (hemoglobin 52 per cent) and digitalized. Cyclopropane anesthesia started by new anesthetist (without approval).

Baby: Lived.

Death: Acute dilatation of heart failure. No prenatal care.

CASE 5.—E. C., May, 1939; referred case; para ii.

Indication: Patient in convulsions on admission. No time to institute treatment.

Type of Section: Postmortem done in bed immediately after she died in convulsions.

Baby: Dead. No prenatal care.

CASE 6.—R. L., 1942; our case, para i.

Indication: Disproportion.

Type of Section: Munro-Kerr low flap.

Baby: Lived.

Death: Pulmonary embolism four hours after section. Good prenatal care.

The first mortality in our personal group was due to sepsis, and overwhelming infection which killed the patient in eight days. It occurred in 1938 before the advent of sulfonamides, penicillin, or other antibiotics which we commonly employ today. The second mortality in our group was due to pulmonary embolism, which we feel is a surgical risk faced by any patient undergoing surgery. In the referred group all four deaths had *no* prenatal care and were seen by us after the emergency existed. The four deaths were primarily pre-eclamptic or eclamptic, although one died secondarily of hemorrhage.

TABLE XIII. MATERNAL DEATHS IN 416 SECTIONS (1935 TO 1946)

	TOTAL CASES	DEATHS	PER CENT
Personal cases	275	2	0.72
Referred cases	141	4	2.80
	416	6	1.44

TABLE XIV. MATERNAL DEATHS IN 3,935 DELIVERIES (1935 TO 1946)

	DEATHS	PER CENT
<i>Personal Cases</i>		
Cesarean	2	
Noncesarean	0	.053
<i>Referred Cases</i>		
Cesarean	4	
Noncesarean	3	.175
Total	9	.225

We realize that the mortality in both mothers and babies in our group are low, due to good luck in some cases, of course, but not unlike the results obtained by many obstetricians who follow a plan of careful study to fit the needs of each case. The maternal mortality in our personal group is far below the maternal mortality for the State of Virginia in 1946, which is 2.2 maternal

deaths per 1,000 live births. We have had no maternal deaths in personal or referred cases since 1942. We are not optimistic enough to think we will not have other deaths. We report this study with no sense of superiority but *rather* offer it to further develop the following ideas:

1. Cesarean sections per se are not the chief cause of maternal deaths that they are thought to be, but rather it is the obstetric complications in most cases that cause death; this applies in general to the fetus.

2. Obstetric patients who are cared for by proper prenatal study and individualization definitely reduce maternal and fetal mortality.

3. Evidence is herewith provided to show that cesarean section is increasing in usefulness, scope, and frequency, and the study as shown justifies it.

4. The study shows the preponderance of cervical sections as compared with all other types. The percentage of extraperitoneal sections is low because we attempt to avoid obstructed labors and resort to section before potential or known infection exists. In our hands, as of present writing, the cervical or low-flap section has fulfilled our needs more satisfactorily than any other type of section. The results justify it.

605 MEDICAL ARTS BUILDING

CESAREAN SECTION IN POTENTIALLY INFECTED PATIENTS USING SULFATHIAZOLE IN THE UTERUS AND THE PERITONEAL CAVITY*

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IT IS a well-established fact that mortality and morbidity are increased in cesarean sections in direct proportion to the length of labor. Especially is this true when the membranes rupture early. Douglas has shown the reason for this by taking cultures in five-hundred patients at the time of operation. He obtained cultures from the intraovular space and from the cervix. His bacteriologic findings, correlated with the clinical results, clearly show that a section performed prior to the onset of labor is relatively safe, but that after labor has begun, the risk from infection increases definitely and progressively with each hour of labor. This is true even if the membranes are not ruptured. From his work, the bacteriologic figures show that cesarean section should not be done on patients who have been in labor for twelve hours or longer. There have been many types of cesarean sections advocated to deliver living babies when patients were known to be infected or potentially infected. The earliest attempt was the Porro section which began in 1876. Porro amputated the uterus at the cervix, thus removing from the abdominal cavity the infected organ.

In 1907, Frank of Cologne devised a method of extraperitoneal section which was later modified by Latzko. This method has been later modified by Waters and Ricci. Some obstetricians are very enthusiastic in their support of this method. Objections to it advanced by others are:

1. The technical difficulties encountered in the performance of the operation.
2. The possibility of opening the peritoneal cavity, thus defeating the purpose for which the operation is done.
3. The danger of injury to the bladder and ureters.
4. The danger in operating on an infected organ.

In 1941, recognizing these dangers, we endeavored to find a safe method of delivery in potentially infected labor with cephalopelvic disproportion, and began the local use of sulfanamides, attempting to achieve bacteriostasis, if not actual sterilization of the uterus and surrounding organs.

Procedure

The technique we now use, after making a few early changes is: Trans-peritoneal-flap operation, longitudinal incision through the lower uterine segment. After delivery of the products of conception, 5 Gm. of sulfathiazole

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crystals are dusted in the uterine cavity, especially around the cervix and the incision; 5 Gm. are dusted under the flap; and 5 Gm. are dusted over the line of sutures in the flap and in the lower part of peritoneal cavity. A total 15 Gm. is administered. We have had only thirty cases in which this plan of treatment has been used, but feel that this is a sufficient number for a preliminary report.

TABLE I

CASE NO.	HOURS IN LABOR	HOURS MEMBRANES RUPTURED	TEMPERATURE AFTER 72 HOURS	INFANT MORBIDITY	INDICATIONS FOR SECTION
1.	30	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
2.	24	10	Normal	Living infant	Cephalopelvic disproportion
3.	56	16	Normal	Living infant	Cephalopelvic disproportion
4.	29	Not ruptured	1 day	Living infant	Cephalopelvic disproportion
5.	24	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
6.	48	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
7.	36	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
8.	18	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
9.	19	19	4 days	Living infant	Cephalopelvic disproportion
10.	18	18	7 days	Living infant	Cephalopelvic disproportion
11.	24	24	Normal	Living infant	Cephalopelvic disproportion
12.	28	Not ruptured	4 days	Living infant	Cephalopelvic disproportion
13.	24	Not ruptured	2 days	Living infant	Cephalopelvic disproportion
14.	36	12	2 days	Living infant	Cephalopelvic disproportion
15.	34	12	2 days	Living infant	Cephalopelvic disproportion
16.	18	Not ruptured	2 days	Living infant	Cephalopelvic disproportion
17.	35	20	Normal	Living infant	Cephalopelvic disproportion
18.	72	60	(Mother died 21 hours after operation. Cause of death at autopsy: Pneumonia, no evidence of metastatic infection.)		
19.	15	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
20.	38	22	Normal	Living infant	Cephalopelvic disproportion
21.	25	Not ruptured	2 days	Living infant	Cephalopelvic disproportion
22.	36	24	Normal	Living infant	Cephalopelvic disproportion
23.	30	20	Normal	Living infant	Cephalopelvic disproportion
24.	36	24	5 days	Living infant	Cephalopelvic disproportion
25.	28	16	Normal	Living infant	Cephalopelvic disproportion
26.	16	Not ruptured	Normal	Living infant	Cephalopelvic disproportion
27.	24	20	4 days	Living infant	Cephalopelvic disproportion
28.	60	26	5 days	Living infant	Cephalopelvic disproportion
29.	84	24	8 days	Living infant	Cephalopelvic disproportion
30.	52	Not ruptured	Normal	Living infant	Cephalopelvic disproportion

All of these patients were admitted as emergencies, deliveries having been attempted by midwives or physicians. Vaginal examinations had been done on most of them, although a reliable history could not be obtained in each case. Some undoubtedly had had several vaginals, as well as bacon rind to lubricate the passage. This is an old midwives favorite technique.

The shortest labor was fifteen hours and the longest was eighty-four hours. The average length of labor before operation was thirty hours. The membranes had been ruptured in 70 per cent of these cases, the time interval ranging from ten to sixty hours. There were twenty-five primiparas and five multiparas. Anaesthetics used were Ethelene, Cyclopropane, or Nitrous oxide and ether.

Length of stay in the hospital was from ten to twenty-seven days, the average was fourteen days.

Our morbidity was 43 per cent, based on any elevation of temperature above normal after the first seventy-two hours postoperative. There was one case of wound infection. Other causes of morbidity were due to low grade infection. There was no thrombophlebitis, no fistulas, nor serious infections.

One mother died twenty-three hours after operation from pneumonia: diagnosis confirmed at autopsy. There was no evidence of puerperal infection, peritonitis, or blood-borne infection to the lungs. This was a case in which we erred in giving an inhalation anaesthetic, cyclopropane, and incidentally this represents the only death we have had in the last one hundred twenty-five full-term cesarean sections on our service at Roper. As this patient did not die from puerperal infection, we feel that our mortality for the mothers is zero, and all of the babies lived.

The sulfathiazole blood concentration taken twenty-four hours after operation ran from 5 to 10 mg. per 100 c.c. of blood, therefore we suggest caution when patients have nephritis or marked anemia. If infection should develop, we give sulfonamides, penicillin and blood transfusions.

Repeat sections have been done on two of these patients, one of which had rather dense adhesions.

For the purpose of comparison and to illustrate the hazards of the extra-peritoneal section, we quote a few excerpts from recently published reports. Williamson and Goldblatt, New York. In 25 cases using the Latzko operation. The peritoneal cavity was opened in 33 per cent. Thrombophlebitis occurred in 12 per cent. Wound infection occurred in 12 per cent. Total morbidity, 44 per cent.

Daichman and Pomerance, Brooklyn. In 100 cases using the Waters extra-peritoneal section. The peritoneal cavity was opened in 36 per cent. The bladder was injured in 17 per cent, including 15 per cent with perforations. Vesicoabdominal fistulas 3 per cent, and one of these also had a vesicovaginal fistula. The average hospital stay was fifteen days; the shortest was ten days, the longest was ninety-two days. Many of the patients drained from the lower angle of the drain site for two to four weeks. Ten per cent had definite wound infections.

Waters, New Jersey. Two hundred and fifty cases using the Waters extra-peritoneal technique. Reports bladder perforations in 1.6 per cent. Peritoneal perforations 27 per cent. There were two deaths, and he omits any postoperative morbidity data.

Conclusions

Transperitoneal cesarean section is made reasonably safe in potentially infected cases when sulfathiazole is placed in the uterus and the peritoneal cavity. Our results compare most favorably with the extraperitoneal sections which are being used in the same type patient.

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MEDICAL COLLEGE BUILDING

ASPIRATION CURETTAGE OF THE ENDOMETRIUM IN A CANCER CLINIC

An Analysis of 200 Cases

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University School of Medicine)*

A TUMOR clinic usually has a large number of women in or beyond their fourth decade who present abnormal genital bleeding and/or discharge as their complaint. It is universally conceded that if physical examination fails to disclose an obvious cause for such bleeding or discharge the patient should be subjected to further study, including diagnostic curettage of the endometrium. Accepted practice calls for surgical dilatation of the cervix and curettage of the endometrium under anesthesia in all cases in which carcinoma of the endometrium is a possibility. A safe and efficient procedure, the only factor which precludes this being an ideal diagnostic measure, is the reluctance with which many women of this age group accept hospitalization and even minor operations. The result is procrastination in many instances where early diagnosis is essential.

Aspiration curettage of the endometrium is a procedure involving no anesthesia and no hospitalization. It is promptly accepted by the patient and therefore can be performed at the initial examination. Most gynecologists emphatically state that aspiration curettage should not be used except in the diagnosis of physiologic changes in the endometrium, and a few doubt its value even in so-called functional problems. Israel and Mazer¹ are in the latter group. They subject their patients to surgical dilatation and curettage without hospitalization and usually without anesthesia, although occasionally ethyl chloride inhalation is used. It seems of some significance to us that 47.3 per cent of their patients refused to submit to the procedure for at least three months. Inventors of various devices for aspiration or punch biopsy of the endometrium have usually warned that they were not to be used when carcinoma of the endometrium was a possibility. Novak² does so, but he also states that he can remove the endometrium as completely with his cannula as with the surgical curette, and that he sometimes performs therapeutic curettage with it. Douglas³ reports that in his clinic aspiration is used as a screen and has substantially reduced the number of surgical curettages performed there.

Procedure

At the Steiner Clinic the number of patients with unexplained abnormal bleeding and/or discharge became so large in 1939 that it was absolutely impossible to subject them to hospitalization because of insufficient facilities and

limited personnel. Rather than attempt to screen such a group with clinical impression and therapeutic trial, it was decided to use aspiration curettage primarily with questionable cases to be subjected to surgery. The instrument used was the author's cannula, not because of any supposed superiority, but because of familiarity with it. It consists merely of a size 12 metal male catheter with a knife edged fenestrum on the convex surface of its shortened beak. It should be emphasized that thorough aspiration curettage of the endometrium does not consist of merely introducing a cannula and haphazardly moving the fenestrum against the mucosa while suction is being applied. After sounding carefully for direction of the canal, dimensions of the cavity and irregularities of its surfaces, the cannula is introduced and the fenestrum applied firmly to one border. Suction is then applied and maintained while the fenestrum is methodically carried over the entire endometrial surface. If the uterus is very movable a tenaculum should be used to steady the cervix. Suction is then discontinued and the instrument withdrawn. The contents of the cannula are then ejected into normal saline solution and the fragments of endometrium are carefully separated from the blood, mucus, etc., to be placed in formalin or Zenker's solution.

Material

The two hundred cases herein analyzed were consecutive and unselected from patients 36 years of age or older, except that neither those diagnosed previous to referral to the clinic nor those aspirated by interns in the first six months of their service were included. Obviously an accurate evaluation of a diagnostic procedure as practically applied to a large group should not include the work of too many novices. The orientation experience of the authors is reflected in this series, however. Only cases followed up adequately for a period of two to six years were included for it is difficult to see how untraced cases could do else than cloud the picture. No morbidity was reported by any of the patients and no untoward bleeding occurred even though their activity was not restricted because of the procedure per se.

Results

The result of this method of diagnostic management of the entire group is shown in Table I. Patients who had experienced a period of amenorrhea of six months or more were judged to be past the menopause (ages 40 to 78 years), while all others, even though they were obviously undergoing the menopause, were placed in the premenopausal group (ages 36 to 57 years). That such an arbitrary separation is practical is reflected in the fact that no atrophic endometrium was found in this latter group, although undoubtedly many of those women had their status obscured by abuse of estrogen therapy, as indicated by the disproportionately large percentage of proliferative and hyperplastic endometriums found among them. All of the proliferative endometriums and six of the eight hyperplasias in postmenopausal patients were due to estrogen therapy. Two patients in this group with hyperplastic endometrium had granulosa cell tumors of the ovary. The ages of the patients with carcinoma of the endometrium ranged from 43 to 78 years, and this lesion plus malignancies of the upper cervix and ovary accounted for 33.4 per cent of the postmenopausal patients' symptoms of abnormal bleeding or discharge without obvious cause, as contrasted with only 3.5 per cent in the premenopausal group.

TABLE I. INITIAL PATHOLOGIC DIAGNOSIS IN ASPIRATION CURETTINGS

	PRE-MENOPAUSAL		POST-MENOPAUSAL		ENTIRE GROUP	
Number of patients	142	71.0%	58	29.0%	200	100.0%
Insufficient tissue (QNS)	15	10.5%	9	15.5%	24	12.0%
Proliferative	21	14.7%	3	5.1%	24	12.0%
Mixed proliferative and secretory	1	0.7%			1	0.5%
Secretory	22	15.4%			22	11.0%
Hyperplastic	61	42.7%	8	13.7%	69	34.5%
Atrophic			13	22.3%	13	6.5%
Chronic endometritis, undetermined	3	2.1%	2	3.4%	5	2.5%
Chronic endometritis, fibromyoma	5	3.5%	2	3.4%	7	3.5%
Chronic endometritis, polyps	2	1.4%	2	3.4%	4	2.0%
Chronic endometritis, puerperal	7	4.9%			7	3.5%
Cervical polyp, precancerous	1	0.7%	1	1.7%	2	1.0%
Adenocarcinoma of endometrium	2	1.4%	16	27.5%	18	9.0%
Adenocanthoma of endometrium			1	1.7%	1	0.5%
Epidermoid carcinoma of cervix	1	0.7%	1	1.7%	2	1.0%
Adenocarcinoma of cervix	1	0.7%			1	0.5%

Obviously, the 12 per cent of the entire group in whom the aspiration curettings were reported to contain "quantity of tissue not sufficient for diagnosis" (QNS) and the 6.5 per cent showing only atrophic endometrium were regarded as undiagnosed, and we were almost as reluctant to accept chronic endometritis of undetermined origin as a definite entity, especially in a woman past the menopause. The final diagnoses in these cases, often arrived at only after prolonged observation, are presented in Table II. One of the QNS patients eventually showing hyperplasia had a surgical curettage unknown to us at another hospital seven days before coming to our clinic for the aspiration. Another patient aspirated by the resident (QNS) was surgically curetted by him ten days later and found to have hyperplasia. The same resident aspirated QNS from a patient whom he surgically curetted ten days later, the report being adenocarcinoma of endometrium, grade I. A postmenopausal patient with QNS on repeated aspiration and curettage was observed for fourteen months before carcinoma of the cervix became evident. In one 78-year-old patient with pyometrium, nothing other than a benign stricture of the cervix could be found in three years' observation. One postmenopausal patient with chronic endometritis ceased to bleed after aspiration and has remained well. All patients in whom the final diagnosis was "undetermined" were followed from three to six years without treatment and without return of symptoms and some are still under observation.

TABLE II. FINAL DIAGNOSES IN GROUP WITH "UNSATISFACTORY" ASPIRATION CURETTAGE DIAGNOSES

	BEFORE MENOPAUSE	AFTER MENOPAUSE		
	Q N S	Q N S	ATROPHIC	CHRONIC ENDOMETRITIS
Atrophic vaginitis		2	3	
Carcinoma of cervix	1	1		
Carcinoma of endometrium		1		
Cervical polyp			3	
Estrogen withdrawal		1		
Fibromyomata uteri	5	1	4	
Fibrosis uteri	1			
Hyperplasia of endometrium	2			
Arterial hypertension		1	3	
Stricture of cervix, benign				1
Diagnosis not determined	6	3		1
Total	15	9	13	2

Unfortunately, the exigencies which resulted in this study allowed us to check only 35 cases with tissue obtained at surgical dilatation and curettage or hysterectomy, excluding cases preoperatively irradiated (Table III). This number seems ridiculously small, but it is explained by the fact that we frequently did not burden our pathologist (who was often without the services of a technician during the emergency) with study of surgical curettings at the time radium was applied to patients whose previous biopsies showed cancer, and that practically all corpus carcinoma received preoperative radiation. One-half of the patients with carcinoma of the endometrium in this clinic are inoperable and one-half of the others refuse hysterectomy. It will be noted that "surgical" diagnosis agreed in full with "aspiration" diagnosis in twenty-six cases and partly agreed in two cases, a total of 80 per cent agreement. Surgical diagnosis disagreed positively with aspiration only twice: (1) a patient whose aspiration curettings were reported QNS was found to have carcinoma of the endometrium at curettage ten days later, (2) another aspirated QNS was found to have hyperplasia at curettage fourteen days later (all work in both cases by the resident). Surgical diagnosis disagreed with aspiration findings *negatively* in that QNS reports on curettage specimens followed aspiration diagnoses in one case each of adenocarcinoma of endometrium grade I, hyperplasia of endometrium, atrophic endometrium, proliferative endometrium, and chronic endometritis. In partial disagreement, (1) a 51-year-old patient, four years postmenopausal, whose aspiration showed "atrophic endometrium with polyps" at laparotomy fourteen days later was found to have "proliferative endometrium with polyps" and a fresh corpus hemorrhagicum was found in one ovary! (2) aspiration in a patient, aged 45 years, revealed "chronic endometritis" while curettage three days later showed "chronic endometritis with polyps."

TABLE III. ASPIRATION DIAGNOSES CHECKED BY "SURGICAL" DIAGNOSES

Surgical diagnosis in full agreement	26
Surgical diagnosis in partial agreement	2
Surgical diagnosis in positive disagreement	2
Surgical diagnosis in negative disagreement	5
Total cases checked without preoperative radiation	35

Comment

Undoubtedly many will look askance at the small number of hysterectomies in the presence of such a large number of patients with hyperplasia of the endometrium in the premenopausal group. We are of the opinion that many of those women were showing the result of estrogen therapy for menopausal phenomena. It should be remembered that stilbestrol was introduced on the market shortly before the beginning of this study. We regard spontaneous hyperplasia of the endometrium with irregular bleeding at menopausal age as a clinical entity, and have always preferred to treat it with x-radiation unless coexisting lesions made surgery desirable. We have no quarrel with the routine hysterectomist who at least can have the advantage of complete detailed pathologic study of the uterus to counterbalance his small but irreducible operative mortality. On the other hand, like Miller,⁴ we do not admit that adequate management of irregular bleeding or discharge from the upper genital tract of women who have completed their families calls for hysterectomy in every case. It is our hope to make the sixty-one patients with endometrial hyperplasia the subject of restudy in the future.

Conclusions

In conclusion, although we were impressed with the success attending the use of aspiration curettage as a screen measure in a cancer clinic, it should not be presumed that we recommend it to displace more generally accepted measures. Neither are we in a position to compare it with the efficiency of vaginal smears as a screen in such patients although a study of this kind would be most interesting. We do wish to emphasize that aspiration curettement is a useful procedure in the study of the endometrium if properly applied and properly interpreted. Its chief advantages, (1) immediate acceptance by the patient, and (2) economy, in that neither hospitalization nor anesthesia is required, weigh heavily against objections to its use, either real or theoretical.

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HYPERESTRINISM IN PRIVATE PRACTICE*

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WE ALL have witnessed the dramatic relief of menopausal hot flushes after estrogen therapy. We have watched estrogenic rejuvenation of the atrophic vaginal mucosa, even years after menopause. Most of us have seen the lactating breast dry up rapidly with doses of stilbesterol which were formerly considered to be large. More recently, certain workers are reporting beneficial effects in selected cases wherein truly massive doses of stilbesterol are administered. We are convinced of the clinical efficacy of estrogens in a variety of clinical conditions.

However, *estrogenic therapy aggravates the complaints of certain patients*. One may reasonably suspect that such complaints may be caused by an already overabundant supply of estrogens. Because of such cases, this paper will suggest a group of symptoms and signs, so frequently occurring together that they may be considered to constitute a "hyperestrin syndrome." If there is such a clear-cut picture as a clinically obvious hyperestrin syndrome, its recognition will stop the abuse of estrogens and will indicate a rational approach to the alleviation of refractory complaints which are too often treated with estrogens.

The advantages of endometrial biopsies, of cytologic scrapings, and of biochemical assays with regard to estrin-progesterone effects are not available to the average medical practitioner. If such procedures were more readily available, the average patient cannot economically afford them. Furthermore, the average patient is very average. She does not have theca cell tumors nor other spectacular anomalies.

Articles in lay magazines have exalted estrogen as the panacea for female ills. And a large volume of the medical literature is little better. Too often, if the patient does not ask for estrogens, the doctor orders such therapy—very often as a "shot in the dark," when he does not know what else to do. Again, too often, his nurse gives the "shots" of estrogen indefinitely and without further supervision. When the estrogen aggravates rather than improves symptoms, the doctor and his patient may wonder why.

Without endowed laboratory and research facilities, the average doctor in private practice must depend on the patient's story and on his own clinical observations. Both the history and physical examination must be routine, and therapeutic indications must be obvious. The average doctor has neither the time nor the inclination to delve deeply nor to ponder patiently in matters which are debated among research workers.

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Consequently, if we can develop a clinical picture, easily recognizable, we shall have benefited both the patient and satisfaction in the practice of medicine. If we can decrease the unintentional abuse of estrogens, we shall both enhance their properly selected use and diminish the hazards of excessive estrogen therapy. Furthermore, we will clarify indications for compensatory therapy and will thereby appropriately alleviate complaints.

As stated, the coincidence of certain symptoms and signs suggest a "hyperestrin syndrome." Like most clinical syndromes, all features may vary in obvious intensity or degree—and individual symptoms or signs may be absent in a given case. The symptoms and signs may be presented as chief complaints. Or they may be determined by questions and examination.

From a review of records made in private practice, the following symptoms and signs are offered for consideration under a classification which may be designated, "hyperestrin syndrome":

1. *Premenstrual nervous and emotional irritability.*—Characteristically, this state is cyclic in its occurrence prior to menstruation and in its partial or total relief with the establishment of free menstrual flow. Patients complain that they feel nervous, depressed, tense. Some patients have used the word "ornery." Some feel apprehensive. Duration of such irritability is often two to five days, and not infrequently seven to ten days before menstruation. The degree of irritability may be mild to severe, even to a sense of incipient insanity. Sometimes, it is the husband who observes his cyclic inaptitude.

2. *Premenstrual or menstrual headache.*—This symptom is inconstant, variable, and not much help as a differentiating feature, because of the frequent occurrence of headaches from other causes, including hypoestrinism. However, the hyperestrin headache is often migraine in type, not relieved by ordinary doses of sedatives, and usually not relieved by gynergen. Frequently, such headache is frontal and suboccipital and is associated with:

3. "*Allergic rhinitis*" of a sort.—Subjectively, the patient may report persistently recurrent annoyance or distress after repeatedly ineffective therapy for the condition. She may complain merely of recurrent nasal "stiffness" and may or may not complain of postnasal drip. The gynecologist usually learns of the condition incidentally, since it is not considered related to his field of work. Objectively, the lower turbinates may appear swollen, pale, or obviously edematous, and a clear, mucous, postnasal drip may be seen by the examiner, simply with the aid of a tongue depressor.

4. *Premenstrual hypersensitiveness of the breasts*, plus a "shotlike" or nodular consistency of the mammary substance.—This is a most common and typical symptom and sign. The symptom varies from the patient's sense of increased heaviness to actual soreness, occurring two to five or even ten days before menstruation. The patient may complain that her breasts are too sore for touch, even by her brassiere. On examination, the texture of the mammary substance is more significant than gross size of the breasts. The hyperestrin type is shotlike to nodular consistency, due to alveolar development. A woman with good estrin-progesterone balance has breasts whose consistency is smooth and not tender. A further distinction may be made from the relatively smooth, cordlike firmness of ductal proliferation. In long-standing, severe cases of hyperestrinism, we see the finer, shotlike or nodular breast developed to the degree, called chronic cystic mastitis, or Schimmelbusch's disease. After treat-

ment and regression of two such cases of the writer, removal of residual cysts showed them to be the "blue dome cysts" of Bloodgood. Others have reported similar relationship.

5. Menstruation is primarily characterized by the usual occurrence of clots and by usually profuse flow.—The menstrual cycle may be short, normal, long, regular or irregular. It is not the purpose of this paper to explain such inconsistency. However, in hyperestrinism the prolongation or shortening of the menstrual cycle may well be due to pituitary inhibition and variable inhibition of ovulation and of corpus luteum development.

6. *Libido* is often low or absent.—However, it may be quite normal. The glans clitoridis may be normal in size and sensitiveness. But more often the glans clitoridis is hyposensitive or completely indifferent and may be as small as a grain of rice. One patient who responded satisfactorily to treatment stated that the clitoridis previously was just as neutrally indifferent as her shoulder. Coitus may be normally satisfactory. Very often it is an indifferent passive accommodation. And not infrequently in simple hyperestrinism without demonstrable pathology, coitus may be extremely distasteful or painful, due to vaginal hyperesthesia.

7. *Pelvic findings* are variable.—But uncomfortable hyperesthesia and some degree of pelvic congestion or edema are usual. Hyperestrinism may be associated with pelvic pathology, such as vaginitis or endocervicitis, which may account for part of the hyperesthesia. But quite as often without apparent pelvic pathology, the hyperesthetic vaginal mucosa appears to be healthy and normal. In marked hyperestrinism, the vaginal mucosa is extraordinarily lush, grayish pink, translucent, clean but moist with deep rugae. The uterus may be small or large normal size but seems more than normally tender. (Note: The examiner must be gentle or else he will learn very little.) The ovaries seem to be within the range of large normal but on careful palpation the surface is nodular, due to immaturely developed follicular cysts, each of which is probably producing estrin. Of course, pathology makes the picture seem more obvious. The pathology may explain the etiology of hyperestrinism. Obviously vaginitis, endocervicitis, cystic cervix, prolapsed or grossly cystic ovary, retroverted or fibroid uterus are conditions which must be considered and dealt with appropriately. Proper treatment of a grossly pathologic entity in the pelvis may improve or correct the hyperestrinism, or it may not. The patient must be considered as a whole and should be treated as a whole to induce her maximum well-being.

If the examiner will regularly look through his microscope at fresh, wet, saline preparations from the vagina, such as those routinely made for trichomonas, he will gain a helpful familiarity with the unstained appearance of vaginal epithelium. Such microscopic observation may require only a minute of time. During that minute, the doctor or his technician may gain an impression of the estrinogen influence on the vaginal epithelium. (Note: The writer first learned of this useful observation from Greenblatt speaking before this association.)

Without time consuming stains and study, the fresh saline suspension from vaginal swab shows the hyperestrinogenic type of vaginal epithelium which are large, distended by a coarsely granular (due to glycogen) cytoplasm with large nucleus. This contrasts with the atrophic (hypoestrin) small vaginal epithelium with concave sides, relatively hyaline cytoplasm, and small or no nucleus. Observations of these contrasting pictures and of intermediate effects may be helpful in completing the clinical picture.

Comment

Since the primary purpose of this paper is the presentation of a hyperestrin syndrome, as such, only brief additional comment will be made:

1. The medical literature is so extensive with respect to estrogens that no attempt is herein made to give due credits. The contribution of this paper, if any, is its organization. The literature since 1940 has been reviewed by the Library Service of the American College of Surgeons in preparation for this paper. Apparently no similar presentation of a hyperestrin syndrome has been made in the American literature. However, after the substance of this paper was completed, a single reference of a similar conception was found in the French medical literature in which similar features were incorporated under the term, "hyperfolliculinism," (Bernard, A.: "Digestive disturbances due to excessive secretion of folliculin" (Translated Title) *Arch. d. mal. de l'app. digestif*, **34**: 56-61, 1945.)

2. The etiology of clinical hyperestrinism appears to be due either to excessive estrin production or to a relative hyperestrinism due to deficient progesterone production. Excessive estrin production appears to be due to abnormal ovarian stimulation with incomplete maturity and development of single or multiple follicular cysts. Such may be due to chronic pelvic congestion (meaning vascular engorgement, stasis, and edema) from retroverted uteri, prolapsed ovaries, vaginitis, endocervicitis, incompleting sexual stimulation, emotional and debilitated states. Abnormal stimulation of primordial follicles by toxic products from a vaginitis or endocervicitis via the lymphatics seems logical and understandable. Such cause and effect is apparently seen frequently all through menstrual life, and subsequently to menopause. The relative hyperestrinism due to hypoprogesteronism is most often seen in the menopausal age due to failure to corpus luteum formation.

A discussion of therapy would doubtless be as controversial as the features of hyperestrinism itself. Obviously, the etiologic factor should be eliminated. General hygiene, tonics, elimination of vaginal and cervical infection, relief of pelvic congestion by hot douches to improve pelvic circulation are primary therapeutic considerations.

Although massive doses of estrinogens may give certain relief by inhibiting pituitary function, it seems to the writer more logical not to give more estrin in hyperestrinism. Frequently the pituitary would seem to be already too much inhibited.

Of the hormones, thyroid in small doses except in actual hyperthyroid patients, seems to be well accepted and beneficial in selected cases, particularly in the generally exhausted type of individual. Progesterone to supplement estrin or testosterone, perhaps to antagonize estrin, are certainly beneficial orally or by hypo in small or larger doses in many patients. In chronic cystic mastitis, a combination of anterior pituitarylike hormone with methyl testosterone alleviates many cases. Recently, reports indicate the need for thiamine by the liver to inactivate excessive estrin concentrations. And there is some

indication that tocopherol (vitamin E) may be synergistic or otherwise beneficial to estrin-progesterone balance.

In conclusion, if collectively we can determine whether or not there is such an entity as a clinical hyperestrin syndrome and if we can clarify its integrated features, we can determine our individual therapeutic attack. The writer's daily observations strongly support the concept of a hyperestrin syndrome which is practical and applicable in private practice.

110 HUNTINGTON BUILDING

THE EVOLUTION OF OBSTETRICS AND GYNECOLOGY IN THE NEAR EAST*†

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THE Lebanon is a small republic, about the size of Rhode Island, lying between Turkey and Palestine at the eastern end of the Mediterranean. It is less dirty, less ignorant, and less torn with eternal political strife than most of the Orient. The mountains rising to 10,000 feet out of the Mediterranean, topped by the great cedars of Lebanon, carry a mantle of snow six months of the year. It is the only oasis in the hot, dusty Near East. The mountains were refuge for the Crusaders in the twelfth century as they fled before the Saracens after the fall of Jerusalem. The monasteries of the Jesuits and Maronites make up the Christian nucleus left in this Mohammedan world. For nearly one hundred years the *American Medical School* at Beirut has sought to bring American and European medicine to the Orient and break down the prejudices of Moslem and Christian alike. Founded as a mission school and later aided by the Rockefeller Foundation, the school has developed into a teaching institution and hospital equal in equipment and personnel to the average in America. Through its wards pass the advanced obstetric and gynecologic pathology of the Near East. The clinical problems here bear mute testimony to the superstitions, traditional practices, and witch doctoring of the people. To make ward rounds on any day cannot do other than to bring into bold relief the evolution and practice of our specialty through the ages.

Excavations at Nippur indicate the presence of urban life 6000 B.C. The Sumarian, Semite, Babylonian, Assyrian, Chaldean, and Persian civilizations flourished and passed on before the Christian Era. Here, man's mind first questioned, then speculated upon his origin and his destination. Jastrow's translation of the clay tablets from the Library of King Assurbanipal of Assyria contains the earliest references extant to that still dubious question, the prognosis for the outcome of labor. On the altars at Petra, a day's journey by automobile from Jerusalem, may yet be seen the stone altars with their chiselled blood troughs where the livers of animals were studied to prognosticate the progress and ultimate termination of labor. The liver is still regarded by Arab tribesmen as the seat of the soul. These tablets refer also to fetal monstrosities and what they portended. The anencephalic indicated an era of peace in the land. Anomalies of the ear foretold a long reign for the prince. It is told by Herodotus that the Babylonians provided a couch in the market place where the lying-in woman was brought to receive the counsel of the villagers. In the Souk or

*Read at the annual meeting of the South Atlantic Association of Obstetricians and Gynecologists, Savannah, Ga., Feb. 6 to 8, 1947.

†AUTHOR'S NOTE: Attention is called to the fact that this article deals with the customs and ideas of the uneducated classes. Throughout the Middle East there are thousands of cultured families with enlightened and modern ideas to whom the related facts do not apply.

Market Place of Bagdad the public clinic is still held, I am told, where anyone may be invited to advise and prescribe. In one of the remote villages of Syria I saw a parturient woman on a cot in front of her home being attended by relatives and friends, exhortations and prayers being administered vigorously. The Babylonian civilization cultivated a true science in astronomy, but lost the scientific spark when they attempted to read into the stars and their constellations the answers to all questions that perturbed the minds of men. The skylight in the ceiling of many public buildings were studded with stars in constellations. One which can yet be seen in Damascus was used solely for prognosis of sex in the unborn. The astrologist is not unknown in the sickroom today.

What astronomy was to the Chaldean, medicine was to the Egyptian. Imhotep, the first physician, designed the step pyramid of Sakhara at the same time that he was prescribing for sterility in Egyptian women. Sterility is the most frequent gynecologic complaint bringing women to the outpatient department of the University. Under the law of the Koran the Moslem may divorce his wife if she is not pregnant within one year of marriage. Even in the relatively fertile, competition is keen among the wives of the same household. A midwife from Palestine gave me an infallible prescription for sterility: "Mix equal parts of goats' milk and bees' honey, bring to a boil, strain, add some oil of almond, and douche before coitus on the twelfth day from the beginning of menstruation." The first part of the prescription is lifted almost verbatim from the Kahun Papyrus about 2000 B.C. The turpentine stupe, not yet extinct in this country, is widely used in the Near East to hasten labor. A bowl of turpentine is placed beneath the midwife's stool and a charcoal burner placed under it, the fumes passing up and into the vagina. I have heard serious complaints from the man of the household about this procedure, the turpentine fumes contaminating the water pipe which he smokes continuously during the course of labor. The use of turpentine in labor can certainly be traced to early Egyptian medicine. The Ibis Papyrus, 1550 B.C., suggested the burning of turpentine resin on the abdomen to hasten labor. This remarkable medical work also prescribes an early test for pregnancy and after the passage of 5000 years still finds a place in practice of the present. "Pound a watermelon with milk of a woman who has borne a son. Give the patient to drink. If she vomits, she is pregnant; if she have flatulence, she is sterile." A Syrian woman told me she had used this prescription many times and in her experience it had never failed in its accuracy.

Obstructed labor brings many women to the hospital after days of futile efforts to deliver at home. It is inconceivable that a woman could survive five, six, seven days of labor and repeated attempts at delivery, but such cases are frequently seen. Vesicovaginal and rectovaginal fistula from pressure necrosis are the rule in such cases, and repair of these fistula presents a problem in surgical judgment to tax the ingenuity of the most audacious. One case of sigmoid vaginal fistula was seen last year. This unquestionably resulted from compression of the sigmoid between the fetal head and pelvic brim. This woman gave a history of intermittent labor over a period of eight days with frequent attempts at delivery. The rachitic pelvis is the most common cause of obstruc-

tion at the inlet. A mummy owned by a physician in Cairo, an alumnus of the university, was shown to me in his home one evening after dinner. The woman had died in labor apparently from cephalopelvic dystocia. The pelvis was of the rachitic type and the fetus was in the right occipitoposterior position. This is one of the rare mummies in which the pregnant uterus has been left in situ. Female circumcision, widely used among the early Egyptians, is still practiced among some of the desert tribes of Arabia. The rite is performed at adolescence. Hemorrhage occasionally occurs when the clitoris is cut, and several of these young girls have been admitted to the hospital.

One hundred years after the death of Galen the sword of Islam had cut out an empire extending from Spain to Bagdad, thus providing a cultural medium to catch the torch of Greco-Roman medicine from the hands of the fallen Roman Empire. The military campaigns of Mohammed and his successors were accompanied by much destruction, the most tragic of which was the burning of the great library at Alexandria. Incidentally, the site of this famous center of learning is not known; this is strange, in view of the fact that so many of Egyptian monuments yet stand. In the peace that followed the slaughter, schools, hospitals, and libraries were re-established. Said the first Caliph. "The ink of the doctor is equally valuable with the blood of the martyr." The medical school at Gondisapor in Persia was the first repository of Greco-Roman medicine. Had Arabic medicine done nothing more, this alone would have placed us in her eternal debt. For, while the sword of Christendom suppressed the desire of men to pursue the study of nature's laws, the heathen school at Gondisapor taught and practiced the medicine of Hippocrates. From here Rhazes and Avicenna sipped the cup of knowledge and from their pens came the writings which projected Grecian medicine across the Dark Ages. The school was founded by the Caliph El Welid, and in 707 A.D. a great hospital was established in Bagdad where Rhazes, father of Arabian medicine, practiced and wrote his "El Hawi," a ponderous work covering the whole range of medicine. He recommended craniotomy in dystocia, the linen fillet in obstructed labor, and binding of the legs for the lacerated perineum. He made no reference to puerperal infection, but recognized the association of putrefaction with the disease by selecting the site of the hospital to be built in Bagdad by hanging meat in various parts of the city and where the meat was last to spoil, there he built the hospital. The foundation of this hospital in the northeast suburbs of Bagdad may yet be seen.

A biography of Rhazes written by a contemporary has never been printed, but a hand copy in Arabic script is to be found in the library of Dr. Sami Haddad in Beirut. Here is told the story of him in his old age, how he became blind and calling the eye surgeon to see him, he was about to submit to the operation when he stopped the surgeon and asked him to name the anatomic membranes of the eye. When the surgeon failed to do so, Rhazes dismissed him saying it was better he continue blind than submit himself to the ignorance of a barber surgeon.

Anointing the vulva and vagina with oil to lubricate the birth passage was recommended by him and remains today a universal practice among midwives,

and must be one of the contributing factors to the high incidence of puerpera; sepsis seen on the wards of the University Hospital. The Beta hemolytic streptococcus, Welsh bacillus, and colon bacillus bring many patients to the wards. One patient was admitted last year with a huge hematoma invading the labia, perineum, and vaginal walls, the result of too vigorous lubrication. The birth stool advocated by Rhazes is still used in the villages of the East, and there are some obstetricians of experience who insist that the sitting posture facilitates the mechanism of labor. Unquestionably, the high incidence of vesicovaginal, rectovaginal fistula, and third degree lacerations of the perineum seeking surgical relief at the hospital can be traced to the use of the delivery or midwives' stool as recommended by Rhazes.

Avicenna, the prince of Arabic physicians, was born in Khorassan. With a precocious intellect he mastered the Koran at the age of 10 years. He led a roving life among the courts of the East, was imprisoned for taking liberties with the Sultan's harem, and escaped to Ispahan where he spent fourteen years in research and writing. Having led a licentious life, he died at 58 years, spending his last days with the Koran after selling his library and distributing his money to the poor. Osler refers to him as one of the great in medicine. His real and indeed his only contribution was divorcing medicine from Oriental magic. This was his great achievement and for six centuries his teachings dominated the medical schools of Asia and Europe. There are some who credit him with the invention of the obstetric forceps because in his canons of medicine appeared the following paragraph: "In extraction he may bind the head about with a border of cord and draw it carefully with repeated tractions. If that does not bring it on, forceps may be used." Most authors believe, however, that Avicenna applied the forceps and hooks only to the dead fetus. From his writings evolved a practice seen today in the distant Arabian provinces of packing the puerperal vagina with salt. This is recommended as prophylaxis against "putrefaction" and to shrink tissues back to their original size. This practice brings patients to the hospital seeking relief from atresia of the vagina, the stenosis often being so great that in many cases only a pinpoint canal is seen replacing the vagina. The hot cautery was recommended by Hippocrates and was endorsed by Avicenna. Multiple punctures over painful areas were recommended. One patient long in labor was seen last year with a uteroabdominal wall fistula from which amniotic fluid was escaping, the cautery having penetrated a bit too deeply.

It would be natural to assume that Arabic medicine should have acquired much anatomic knowledge because of the frequency with which human dissection was done in Egypt for the purpose of embalming. Such is not the case, however. Removal of the viscera after death was relegated to a low caste, and their observations were never recorded. Mohammed dealt the final blow to human dissection when he declared the dead body unclean and forbade the touching of it with bare hands. Permission for autopsy today is usually obtained by subterfuge. The resident staff at the hospital utilizes methods which might be considered somewhat unethical in America. On one occasion a patient dying of peritonitis presented many interesting features which made us anxious to

obtain permission. The patient's home was many miles from Beirut and the resident assured the husband that transportation of the body without first removing the viscera might result in dire consequences. There was a similar case, he told the relatives, in which removal of the infected organs had not been permitted and during the journey homeward, the gas generated from the infection and the jostling of the body over the rough, hot roads resulted in an explosion which had disseminated parts of the body and the vehicle with its occupants over the Syrian desert. Permission was obtained. Transportation of dead bodies in the Near East is accompanied by many difficulties. In order to transport a body across the borders, it must be hermetically sealed in a special casket as prescribed by the law of the country. This is an expensive operation and so, the family often seeing that death is inevitable, removes the patient in a moribund state from the hospital in order to avoid this expense. It is not unusual to have patients in the last stages of their illness lifted onto the back seat of a Ford touring car and hustled out of the hospital gates.

The practice of gynecology suffers from the prejudices engendered by Islamic teachings regarding the place of women in society. Many Mohammedans refuse permission to their wives' admission to the hospital. Under the law of the Koran the husband should be present when the doctor examines his wife. Consequently, the home delivery service under the supervision of the midwives forms an important part of the obstetric teaching service. The medical students accompany the midwives and are allowed to observe deliveries. Many serious obstetric complications are managed in the home. On one occasion an eclamptic was seen in her home and, according to records kept by the medical student in attendance, the patient is known to have had 49 convulsions before permission was granted to admit her to the hospital. After admission three convulsions occurred, these were controlled by intravenous magnesium sulfate, and the patient recovered following spontaneous delivery of stillborn twins. In the villages the obstetrician when called in consultation by a midwife must often operate under a sheet.

It must be remembered that women of the East enjoy practically no personal freedom. Their living quarters are separate from those of the male, the windows are barred, the doors to the "hareem" from which we get the word "harem" are heavily bolted, and the master of the household takes the key with him when he leaves in the morning. However, the women manage to keep up with male activities by a specially constructed grill between their apartments and the living room of the males. This was impressed on me one evening when, after holding a clinic in Aleppo, I dined at the home of a wealthy Aleppo physician. Of course no women were in evidence. During a sumptuous and elaborate dinner which consumed half the night, I indulged myself to the extent of three large onions. They have an onion, grown only in the Aleppo district, about the size and consistency of an apple, which has a delicate and delicious flavor. The next morning we were to have a clinic in Bagdad and a British army plane flew us the 500-mile journey. Coming into the hotel dining room for breakfast I found in front of my plate another of these onions. The women

of the household had seen my apparent enjoyment of them and had sent one by special carrier to Bagdad.

These women are remarkable in many ways. They are keen students of poetry and the feminine arts. They make practically all of the famous oriental rugs, and the designs are copied from the gardens as seen from their windows. Such magazines as *Harper's Bazaar* and *Mademoiselle* are not unknown to them, however, and beneath the black veil and black kaffiye they are often dressed in the most modern Parisian or New York fashions.

Sex morality is high among the Moslem women; virginity is an absolute prerequisite for marriage. The hymen is sacrosanct. Special religious courts are in constant session on cases of doubtful virginity. Doctors are constantly being called to testify for or against the integrity of the hymen. An elaborate ritual is set up for the marriage night. I was invited to the wedding feast at the villa of a wealthy man outside of Bierut. An elaborate feast was served by the host and his sons, the guest of honor being the bridegroom. Of course no women were present. After the festivities the bridegroom was given the salutations of all present and he left the banquet hall to join his bride in the women's quarter of the house. Perhaps half an hour passed and there appeared at the door the father of the bridegroom holding aloft that all might see a beautifully embroidered piece of linen on which were the telltale spots of bona fide virginity. Brothers are often the self-appointed protectors of their sisters' virginity. A young Moslem girl gave birth out of wedlock in the American Hospital last year and was attacked by her brother as she emerged from the hospital after bearing her child. This strict sex morality and sex isolation engender a high incidence of perversion in both sexes. It is a major problem in the Near East.

All of these problems are being met, and slowly but surely will be overcome by the teaching at the American University. Another impetus to scientific medicine is coming from the new Hospital and Medical School at Jerusalem. Just how far this will go depends upon political trends, but the American school stands out as a beacon light, carrying scientific enlightenment to a people who for 5,000 years have known little and cared less for the better things of life.

Original Communications

DYSMENORRHEA AND OVULATION: CORRELATION OF THE EFFECT OF ESTROGEN THERAPY ON PAIN, THE ENDOMETRIUM, AND THE BASAL BODY TEMPERATURE*

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A MULTIPLICITY of theories makes it plain that the etiology of functional dysmenorrhea remains an unsolved problem. A great variety of treatments which at best give 60 to 70 per cent satisfactory results in the hands of their staunchest advocates also shows that no one of them strikes at the basic, underlying factor. Furthermore, it is not clear by what mechanism relief, when it occurs, is actually accomplished.

One of the most striking characteristics of functional dysmenorrhea is its invariable correlation with a progestational endometrium^{1, 2} or an ovulatory type of basal temperature curve.³ On this basis it has been concluded that ovulation is a prerequisite for dysmenorrhea, and treatment aimed at the suppression of ovulation has been undertaken.^{1, 4, 5, 6} Two to 12 injections of estrogen at intervals ranging from one to ten days were used. In one series² as many as 77 per cent of the treated cycles was pain-free. This injectional therapy, however, often disturbed normal menstrual rhythm. Oral therapy with diethylstilbestrol^{5, 7} and ethinyl estradiol⁶ also has been used with similar results. To our knowledge, no one has attempted to correlate response to therapy with various dosage levels of estrogen. All workers concur in the necessity for starting therapy well in advance of the time of expected ovulation, and for continuing treatment approximately twenty days. It is advised usually that treatment be omitted every third cycle to insure adequate endometrial regression. Some investigators claim^{2, 5} that partial improvement persists after the discontinuation of therapy, but others feel that this treatment has no effect whatever on subsequent cycles, being merely temporary, preventive therapy.⁶ All agree that treatment does not impair subsequent fertility.

*Part of the expenses of these studies was defrayed by a grant to one of us (E.C.H.) by Ayerst, McKenna & Harrison, Ltd., whose products diethylstilbestrol (estrobene) and conjugated estrogens (premarin) were used.

NOTE: The Editors accept no responsibility for views and statements of authors as published in their "Original Communications."

Materials and Methods

Our material consists of 54 unselected patients of whom 16 have been reported previously.⁵ These 16 patients, and 8 others, furnished only baseline data of untreated cycles. The effects of treatment were studied during 178 cycles of 30 patients. The correlation of dysmenorrhea and ovulation was studied by endometrial biopsies and basal temperature records. Eighty-two biopsies were obtained from 26 patients, and 11 temperature records were obtained from 5 patients. Biopsies were taken within eighteen hours after the onset of bleeding and were read independently by each of us. Daily rectal temperatures were kept in a manner described elsewhere by one of us.⁸

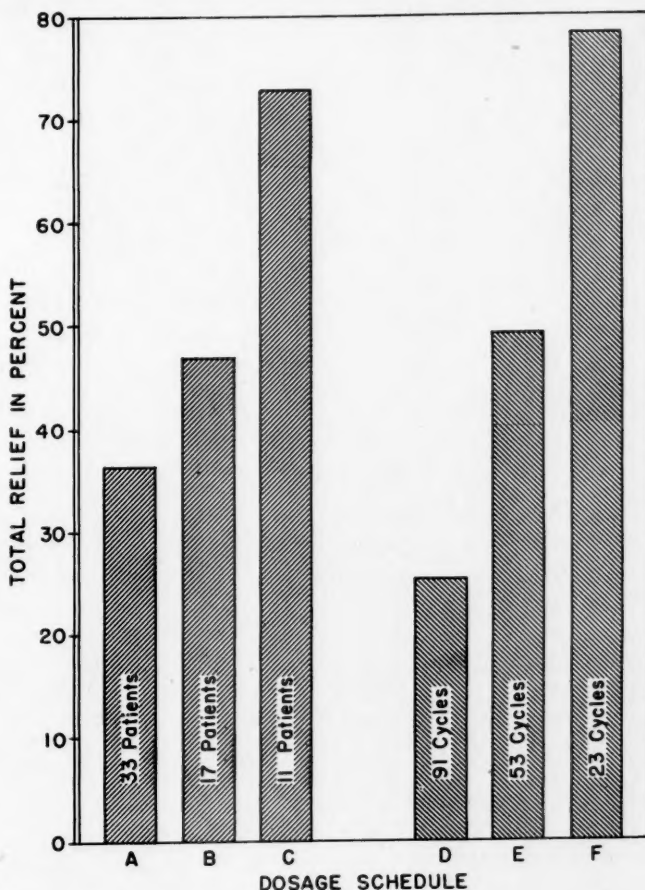


Fig. 1.—The effectiveness of various total dosages of estrogen:
A) less than 25 mg. of premarin or 20 mg. of diethylstilbesterol.
B) 25 mg. of premarin or 20 mg. of diethylstilbesterol.
C) 50 to 75 mg. of premarin or 40 to 60 mg. of diethylstilbesterol.
D) less than 25 mg. of premarin or 20 mg. of diethylstilbesterol.
E) 25 mg. of premarin or 20 mg. of diethylstilbesterol.
F) 75 mg. of premarin or 60 mg. of diethylstilbesterol.

In the evaluation of data, treatment was considered successful only when there was complete relief of pain. In most instances in which we note failure of treatment, there was partial relief of pain, but the large personal factor which enters into the interpretation of "partial relief" renders these results of questionable value.

The various schedules of treatment which have been used in this group of patients are outlined in Fig. 1. Patients treated within the last few years received oral therapy exclusively; this was given from the fifth to the fifteenth, or from the fifth to the twenty-fifth days of the cycle. Diethylstilbestrol or conjugated estrogens, chiefly estrone sulfate (premarin) was used. The total cycle dosage varied from 5 to 60 mg. of diethylstilbestrol and from 6.25 to 75 mg. of premarin.

Most of the patients had received antispasmodics, placebos, and other medications without benefit. The oral estrogenic therapy was administered under circumstances in which the psychotherapeutic factor, intentional or otherwise, was held to a minimum, especially as several members of the staff maintained a skeptical attitude toward the possible benefits of treatment.

Results

Correlation of Ovulation and Dysmenorrhea.—

1. *Biopsies:* There was a total of 82 endometrial biopsies of 26 patients. Each patient had one or more baseline biopsies before the institution of treatment. Additional biopsies after untreated cycles were obtained from time to time. In the 50 baseline or untreated cycles, 46 biopsies showed progestational, and 4 showed estrogenic endometriums. All progestational endometriums were associated with dysmenorrhea. In those dysmenorrheic women in whom an estrogenic endometrium was encountered, no pain was present during that particular cycle. A dramatic example of this is afforded by one patient of this series. Biopsies at the termination of seven consecutive untreated cycles were as follows: progestational, estrogenic, estrogenic, progestational, estrogenic, progestational, progestational. Severe dysmenorrhea accompanied each progestational period, whereas bleeding from an estrogenic endometrium was invariably pain-free.

Of 32 biopsies taken at the end of treatment, 21 were progestational and 11 were estrogenic. Pain was associated with 20 of the 21 progestational periods; all of the 11 estrogenic cycles were pain-free. The single pain-free ovulatory period occurred from a very early progestational endometrium.

Although we have made no distinction between various degrees of pain, it is interesting to note that pain was very slight during three cycles in which the endometrium showed minimal progestational change. No attempt was made to correlate the severity of pain and the degree of progestational development, but the impression was obtained that a correlation possibly might exist.

In a previous publication from this department,⁵ it was concluded that there was no constant relationship between the presence or absence of dysmenorrhea and the type of endometrium from which bleeding occurred. The original biopsies of this previous study were re-examined independently by us. All three of us, including one of the authors of the original paper (E. C. H.), found that some of the biopsies previously read as estrogenic showed progestational elements. For this reason, the biopsy readings were correlated again with the clinical histories and the revised correlations agreed with the present observations.

2. *Temperature records:* The studies of several investigators^{9, 10} have shown conclusively that an ovulatory type of basal temperature curve is associated with a progestational endometrium and, therefore, with an ovulatory cycle. In view of this, we have studied patients with dysmenorrhea by basal temperature records as well as by biopsies. Temperature records were obtained from five patients of this study; there was a total of 11 cycles recorded. Five of these cycles showed an ovulatory rise and were associated with pain; six showed an anovulatory type of curve and were pain-free.

Results of Treatment.—The results of various therapeutic schedules are shown in Fig. 1. Our data were distributed in a manner which did not permit statistically significant comparison between 10- and 20-day schedules of the same dosage. Our impression was, however, that the longer course of therapy yielded more satisfactory results.

A total of 33 patients was treated with a total dose of less than 25 mg. of premarin or of less than 20 mg. of diethylstilbestrol. Twelve, or 36.4 per cent, obtained total relief. With a total dose of 25 mg. of premarin or of 20 mg. of diethylstilbestrol, 8 of 17 patients (47.0 per cent) obtained total relief. With a dose of 50 to 75 mg. of premarin or of 40 to 60 mg. of diethylstilbestrol, 8 of 11 patients (72.7 per cent) obtained total relief. These figures are statistically significant.

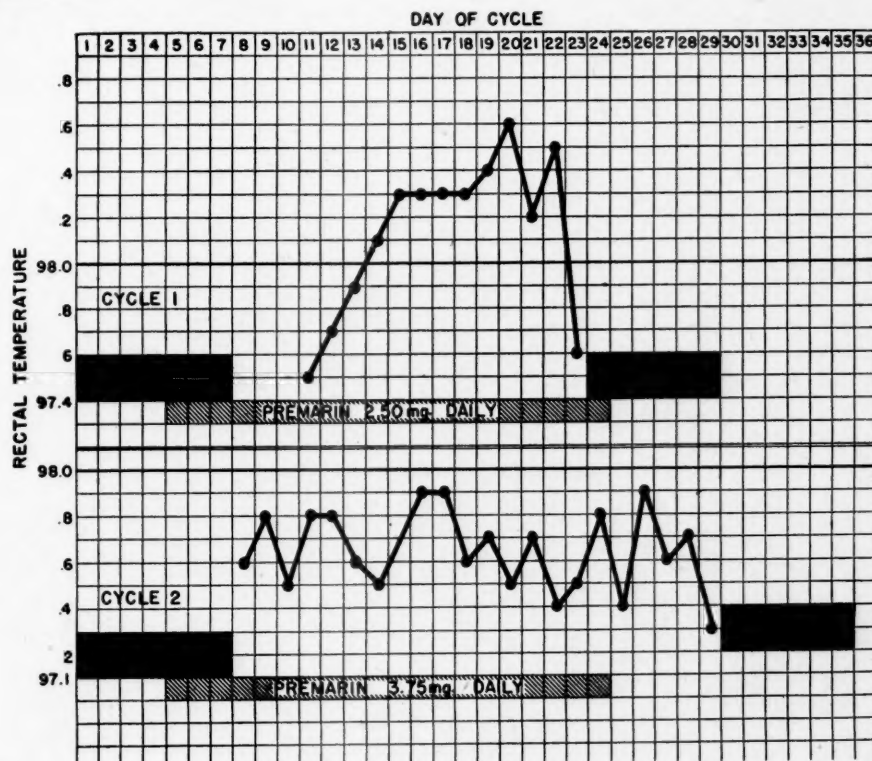


Fig. 2.—Basal body temperature records of a dysmenorrhea patient treated with varied dosages of estrogen.

Ninety-one cycles were treated with doses of less than 25 mg. of premarin or of less than 20 mg. of diethylstilbestrol; of these, 23, or 25.3, per cent were totally relieved. Fifty-three cycles were treated with 25 mg. of premarin or with 20 mg. of diethylstilbestrol; of these 26, or 49.1 per cent, were totally relieved. Twenty-three cycles were treated with 75 mg. of premarin or with 60 mg. of diethylstilbestrol; of these 18, or 78.3 per cent, were totally relieved. These results are statistically significant.

It is obvious, therefore, that the chances of obtaining relief in any cycle or in any individual patient increase as the dose of estrogen is increased.

The Correlation of Therapeutic Response and Ovulation.—These correlations are based on 32 biopsies and 10 temperature records. Treatment failed to provide total relief in 26 of these 42 cycles. All 26 failures were associated

with a progestational endometrium or an ovulatory temperature curve, indicating that therapy had not suppressed ovulation. In the 16 cycles in which treatment was successful, an estrogenic endometrium or a flat temperature curve was encountered 15 times; in one instance a very early progestational change was present.

Several interesting features are shown by the clinical courses of two patients. Fig. 2 illustrates the temperature curves of one of the patients during cyclic treatment with premarin. During cycle 1 the patient received 2.5 mg. of premarin daily for twenty days. The temperature curve shows an ovulatory rise, and the subsequent period was accompanied by dysmenorrhea, despite a relatively large dosage. The following month the dosage was increased to 3.75 mg. daily for twenty days; cycle 2 shows an anovulatory type of curve, and the subsequent period was pain-free. In Fig. 3 are shown the temperature curves of three consecutive cycles of the other patient, treated each cycle with 2.5 mg. of premarin daily for twenty days. The first and third cycles were entirely pain-free, and the temperature curves were of an anovulatory type. The second cycle was accompanied by dysmenorrhea, and the temperature curve shows evidence of ovulation.

These two patients illustrate clearly the fact that the dosage required for the relief of pain varies with the individual; moreover, it may vary from cycle to cycle of the same patient.

A much smaller dosage has been found adequate in many patients; on the other hand, a dosage of 3.75 mg. for twenty days has failed to relieve pain during some cycles. It is evident, therefore, that treatment must be followed by basal temperature curves or biopsies to establish the optimal dose, which is defined as the minimal amount necessary to suppress ovulation. Treatment should not be considered a failure until it has been shown that the dosage was large enough to suppress ovulation. In those patients, in whom inadequate doses afford partial relief, one may expect total relief from adequate therapy.

Discussion

Evaluation of Estrogenic Therapy.—We have tabulated results according to the number of *patients*, as well as the number of *cycles*, treated. The percentage of cycles in which pain was relieved totally is greater than the number of patients treated successfully, since if the first course of therapy failed, further therapy often was abandoned; whereas, if the first cycle of treatment was successful, therapy often was continued. Others² have evaluated results on the basis of the number of individual cycles. We feel, however, that this might not give a true picture and, therefore, we have evaluated the results in individual patients as well as in individual cycles. Reports indicate that various treatments may afford 60 per cent satisfactory results. Our results are consistently better than those obtained by empiric methods.

In contrast to the findings of others,^{4, 6} our schedule of treatment (from the fifth to the twenty-fifth day of the cycle) has not resulted in gross disturbances of the menstrual rhythm, skipping of periods, or other complications. This is true even when our dosages are much larger than those which usually are advocated. From a considerable experience with cyclic oral estrogen therapy in the treatment of functional disturbances of uterine bleeding, we have found¹¹ no cumulative estrogenic effects when this treatment is followed for long periods of time.

Cyclic estrogen therapy offers only a temporary prevention of dysmenorrhea, and should not be construed as curative treatment. The temporary sterility induced by adequate treatment does not impair subsequent ovarian function. It is obvious that this method of treatment should not be used in patients in whom pregnancy is desirable.

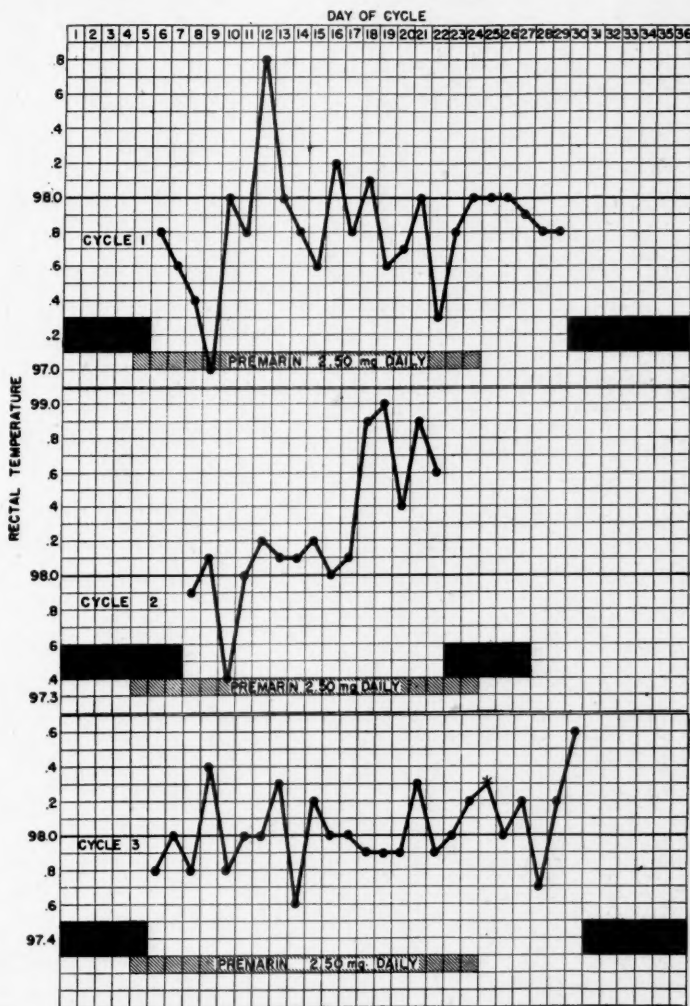


Fig. 3.—Basal body temperature records of a dysmenorrhea patient treated with constant dosages of estrogen.

Suppression of ovulation may be obtained by the use of androgens, and this has been advocated as a treatment of dysmenorrhea. Although doses as large as 900 mg. of testosterone propionate per month have been used,¹² the results are less favorable than those of estrogen therapy. Androgen dosage at this level will cause distressing, and often irreversible, signs of masculinization. In view of the relative dangers as compared to the slight possible benefit of androgen treatment, its use in dysmenorrhea is contraindicated and wholly unjustified.

The Role of Progesterone in Dysmenorrhea.—We may discount many of the older theories of functional dysmenorrhea,¹³ since it now seems obvious that progesterone is a prerequisite for its appearance. Whether this action of progesterone depends on its actual presence in the system or results from its effects on various tissues is not definitely established. The latter possibility seems more likely in view of the fact that all demonstrable progesterone has been eliminated from the system^{14, 15} at the time when symptoms are maximal. This time relationship has suggested to some workers that progesterone withdrawal or deprivation may be an etiologic factor in dysmenorrhea. The fact that substitutional doses of progesterone fail to prevent dysmenorrhea¹⁶ negates this theory. Furthermore, we have observed patients with ovarian agenesis in whom dysmenorrhea was produced for the first time by the addition of progesterone to their cyclic estrogen therapy; the dysmenorrhea did not recur when progesterone was discontinued. Injections of large doses of progesterone (25 mg.) during midcycle have been followed within twenty-four to forty-eight hours by dysmenorrhea-like pain.

Cannon⁷ has suggested that dysmenorrhea results from abnormal fragmentation of the progestational endometrium which is associated with overactivity of progesterone. Since injections of progesterone have resulted in dysmenorrhea-like pain in the absence of uterine bleeding, it cannot be fragmentation per se which is responsible for the pain.

There is no evidence which indicates that patients with dysmenorrhea have a physiologic excess of progesterone.¹⁷ So far as we can determine, the tissues affected by progesterone show no undue response. There is no evidence of an estrogen deficiency in dysmenorrhea. Theories that altered progesterone metabolism^{17, 18} may cause dysmenorrhea are based on the supposition that an estrogen deficiency exists, and, therefore, are not substantiated by available evidence.

It has been theorized that dysmenorrhea is the result of vascular spasm.⁵ Estrogens have a parasympathicomimetic (i.e., vasodilator) action. In estrogen deficiency this check on the action of the sympathetic nervous system is decreased with a resultant vasoconstriction, spasm, and pain. There are three main objections to this theory. In the first place, estrogen deficiency has not been proved. In the second place, no relation has been established between vasomotor spasm and dysmenorrhea. In the third place, common vasodilators as nitrites or nicotinic acid neither will relieve nor prevent dysmenorrhea. Dysmenorrhea, furthermore, neither is relieved nor prevented by progesterone, which is known to effect arteriolar dilatation.

The controversial effects of progesterone on the contractility of the uterine musculature are not a factor to be considered, since we feel that abnormal uterine contractility or spasticity plays no part in the pathogenesis of dysmenorrhea. Investigations¹ have shown that the pattern of uterine contractions during the various phases of the cycle is the same for normal and for dysmenorrheic women.

The role of psychogenic factors in functional dysmenorrhea is not minor; in fact, it is the only etiologic factor recognized by some investigators. In one

of the most recent psychiatric theories,²⁰ dysmenorrhea is considered merely as a symptom complex which is a manifestation of an underlying psychoneurosis. Various phenomena as interstitial edema, basal temperature elevation, increased smooth-muscle sensitivity, and alterations in the status of the breasts, genitals and vasomotor system are the physiologic results of progesterone secretion and, therefore, follow ovulation. The multiple sensory stimuli collectively may reach levels which exceed the lowered threshold of some patients; these patients then interpret the resultant psychic pattern as dysmenorrhea. To the adherents of this theory, treatment with estrogens should constitute a sound, physiologic, therapeutic adjunct to psychiatric treatment, since it eliminates the stimuli which initiate this chain of events.

Summary

1. Fifty-four patients were studied for a total of 228 cycles. Eighty-two biopsies and 11 basal temperature records were obtained.

2. All anovulatory cycles were pain-free. All ovulatory cycles were accompanied by pain save in one instance in which an early progesterational endometrium was associated with no pain.

3. Of 33 patients treated with a total dose of less than 25 mg. of premarin or less than 20 mg. of diethylstilbestrol, 12, or 36.4 per cent, obtained total relief. Of 17 patients treated with 25 mg. of premarin or with 20 mg. of diethylstilbestrol, 8, or 47 per cent, obtained total relief. Of 11 patients treated with 50 to 75 mg. of premarin or with 40 to 60 mg. of diethylstilbestrol, 8, or 72.7 per cent, obtained total relief.

4. Of 91 cycles treated with less than 25 mg. of premarin or with 20 mg. of diethylstilbestrol, 23, or 25.3 per cent, were totally pain-free. Of 53 cycles treated with a total dose of 25 mg. of premarin or with 20 mg. of diethylstilbestrol 26, or 49.1 per cent, were totally pain-free. Of 23 cycles treated with 75 mg. of premarin or with 60 mg. of diethylstilbestrol 18, or 78.3 per cent, were totally pain-free.

5. In order to establish the optimal dosage for the individual patient, it is advisable to follow treatment with endometrial biopsies or with basal temperature records.

6. No gross menstrual disturbances followed the described schedule of estrogen administration, although the dosage of some patients was relatively large.

7. The presence either of progesterone or of its physiologic effects is a prerequisite for dysmenorrhea. Although it is initiated by progesterone, other details of the pathogenesis of dysmenorrhea are unknown.

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THE TREATMENT OF URINARY STRESS INCONTINENCE BY THE IMPLANTATION OF A TANTALUM PLATE

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URINARY stress incontinence, whether due to congenital anomalies, intrapartum injury, or surgical trauma, challenges the gynecologist's interest, both from its physiologic and therapeutic aspects.

The causes of urinary stress incontinence are at times difficult to correlate with the anatomic findings found on examination. Generally it can be said that relaxation of the supports of the pelvic organs is often accompanied by urinary stress incontinence.

In a previous study of cases observed in the Gynecological Service of Mount Sinai Hospital¹ it was shown that 37.8 per cent of all cases that required vaginal plastic procedures had urinary stress incontinence. The remaining 62.2 per cent of cases with different degrees of uterine and vaginal prolapse did not have incontinence. This would tend to focus our attention on the sphincter mechanism of the bladder which may be independent, to a certain degree, of uterine and vaginal support.

Azevedo and Campos,² Taylor and Watt,³ and Thomson⁴ claim that changes in the structure of the bladder support show a constant relationship to incontinence. These changes result in loss of angulation of the urethra to the bladder wall, and descent of the posterior wall of the urethra. However, Barnes,⁵ in his studies of urethrograms, does not confirm the above findings, as x-ray studies have not shown a constant relationship of these anatomic changes when incontinence is present. On the other hand, studies of continent women have shown wide variation in urethral angulation. Cystograms studied by Stevens⁶ and others show funneling of the bladder base toward the urethra in urinary stress incontinence.

Apparently there is no close correlation between the anatomic changes in the pelvic floor and the degree of sphincter insufficiency. It is postulated by many workers that the amount of urinary stress incontinence is directly related to the extent of damage to the urethra and the functioning muscles. Yet it is questioned which anatomic alterations are directly responsible for involuntary loss of urine.

The large number of procedures recommended for the cure of urinary stress incontinence is an indication that the results have not been satisfactory. It is often difficult to choose a procedure for the cure of incontinence in a given case, as the degree of evident structural changes may be unrelated to the degree of insufficiency of bladder control. The method first used is usually a simple one and, if it fails, is succeeded by a more complicated operative procedure. These become more extensive with successive failures.

The Kelly⁷ operation, the more extensive procedure of Kennedy,⁸ and the recently devised Aldridge⁹ operation, as well as many other types of urethroplasty, tend to restore the normal condition of the overstretched urethra, replace the urethra into its normal position beneath the pubic arch, and construct a proper support for the bladder neck and urethra.

W. T. Kennedy,¹⁰ in a recent article, has described the true sphincter of the urethra as composed entirely of circular smooth muscle fibers surrounding the middle and inner thirds of the urethra, together with their associated longitudinal smooth muscle fibers. He suggests that there is a definite anatomic and functional interrelationship between the muscle of micturition and the sphincter of the urethra. This interplay, he claims, results in functional closure of the bladder when the true sphincter retains its circular course, and incontinence will be present in proportion to an elliptical distortion of the true sphincter, and will be permanent if the sphincter is unable to return to its circular form. This distortion is brought about by relaxation of the muscle and (or) periurethral adhesions. He also feels that the levator ani, the bulbo cavernosus, and the transversus perinei muscles aid in the closure of the bladder. He concludes from his anatomic studies that, in order to effect bladder control, it is essential to restore as much as possible all damage inflicted upon the muscular structures and to put the internal meatus of the urethra as far back in the pelvis as possible. By this replacement of the proximal portion of the urethra the relaxation of the muscle of micturition is corrected.

The closure of the bladder is accomplished by the external and internal bladder sphincter aided by the tangential insertion of the urethra into the bladder. The external bladder sphincter consists of striated muscle fibers and is a part of the urogenital diaphragm. The external sphincter is the voluntary sphincter of the bladder. It is our belief, in accordance with the investigations of Von Ludinghausen¹¹ that the internal sphincter, the important bladder closure muscle, consists of two loops of smooth muscle fibers situated at the neck of the bladder, merging with the bladder wall (Fig. 1). The anterior loop is horse-shoe shaped and its fibers encircle the neck of the bladder anteriorly. This loop is open at the posterior urethral wall and its long fibers merge with the longitudinal muscle fibers of the posterior bladder wall. The second loop is also horse-shoe shaped and encircles the neck of the bladder posteriorly. Its long fibers merge with the musculature of the anterior bladder wall. The closure of the bladder is accomplished by the action of the two loops. When the posterior loop contracts, the posterior urethral wall and the bladder neck are tensed and fixed, while the opposing contraction of the anterior loop brings the anterior urethral wall toward the posterior wall, thus accomplishing closure of the bladder.

An analysis of operative procedures used for the cure of stress incontinence involve a common principle. Anatomically they accomplish a thickening and strengthening of the tissues of and around the proximal portion of the urethra and the adjacent trigone of the bladder. This anatomic reconstruction results in a fair percentage of functional restoration. The different operative procedures used achieve a functional result which approaches the normal physiological sphincter mechanism of the bladder.

It is evident that obstetric or surgical injuries affect both the external and internal bladder sphincter. The injury to the internal bladder involves mainly the inferior loop, thus impairing the function of the sphincter muscle. All operative procedures produce a more or less fixed plane at the posterior urethral wall and bladder neck. Thus the undamaged superior loop of the

internal bladder sphincter is able to approximate the anterior urethral wall against the fixed posterior wall, imitating the normal sphincter mechanism of the bladder.

The disadvantage of all the known operative procedures is that the supportive tissue used for reconstruction may, in the course of time, atrophy or relax, thus depriving the posterior urethral wall of its fixation. This results in imperfect occlusion of the urethra, as the superior sphincter loop cannot sufficiently approximate the anterior urethral wall against the relaxed posterior wall of the urethra.

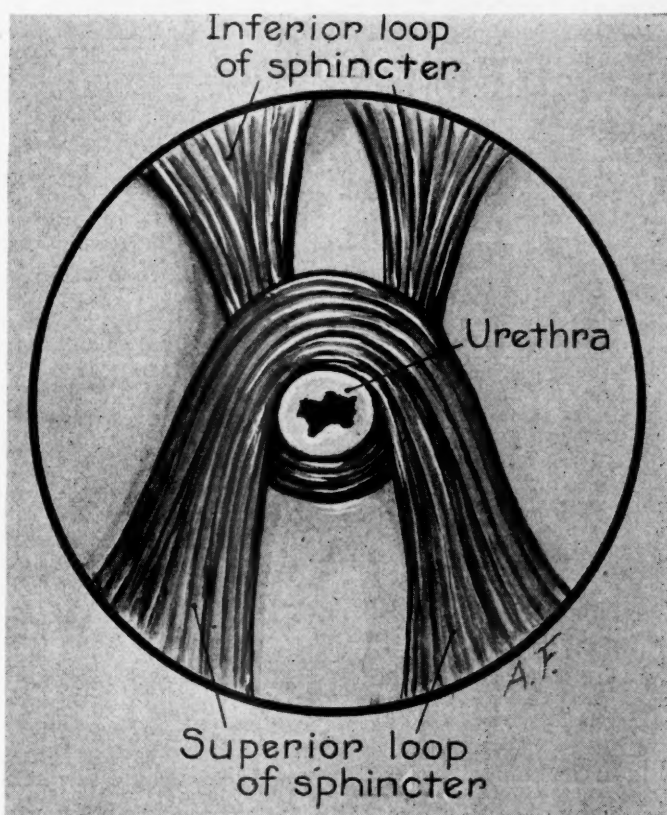


Fig. 1.—The superior and inferior loops of the internal bladder sphincter as demonstrated by Von Ludinghausen.

For many years we have been striving for a method that would accomplish a permanent fixation of the posterior urethral wall and bladder neck. We have tried various methods, utilizing all the known operative procedures, in addition to transplantation of fascial strips, but the results, while generally good, were not entirely satisfactory. We have recently resorted to a plastic procedure by the implantation of a metallic plate beneath the proximal third of the urethra and the urethral vesical junction.

Burke¹² and Burch and Carney¹³ were the first to make surgical use of tantalum. Burke, in 1940, reported his work with tantalum bone sutures and

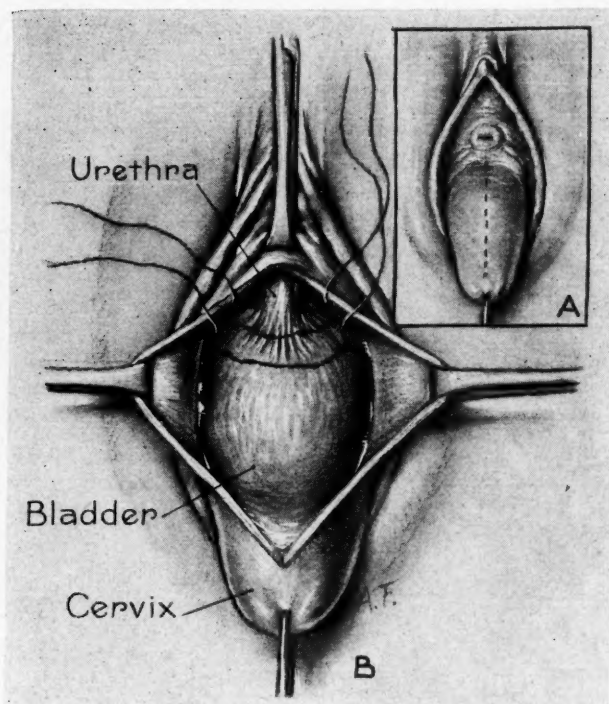


Fig. 2.—A. Line of incision in anterior vaginal wall. B. Urethra and bladder exposed. Two Kelly sutures placed at bladder neck.

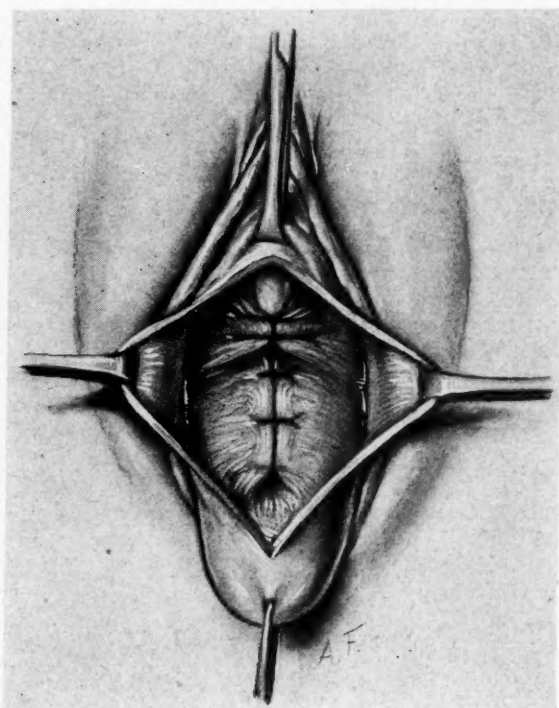


Fig. 3.—Kelly sutures tied and plication of vesicovaginal fascia completed.

plates. He found no clinical or anatomic evidence of bone or soft tissue irritation due to tantalum. In 1942 Pudenz¹⁴ used tantalum clips for hemostasis in neurosurgery. He found that tantalum caused only a minimal fibroplastic proliferation. Later, Pudenz,¹⁵ Fulcher,¹⁶ and Spurling¹⁷ reported on the use of tantalum plates for repair of cranial defects. Since then many reports on the use of tantalum in neuro-, orthopedic and plastic surgery have appeared.

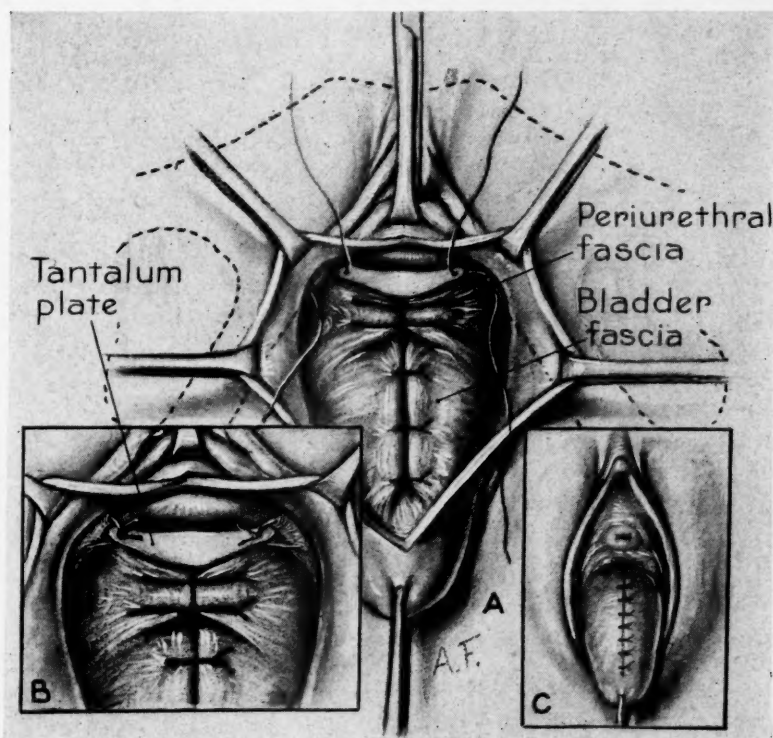


Fig. 4.—A. Tantalum sutures passed through the periosteum on the inner aspect of the descending rami of the os pubis and the tantalum plate in place. B. Tantalum plate fixed at urethrovesical junction by tying the tantalum fixation sutures. C. Vaginal wall closed with interrupted sutures.

We resorted to the use of tantalum because of the sufficient evidence of its inertness in tissues, noncorrosiveness and nonabsorbability. The malleability of tantalum was an additional advantage for our use. Our underlying idea was to permanently strengthen the posterior urethral wall near the bladder junction, thereby restoring a fixed posterior urethral and bladder neck plane against which the intact superior sphincter loop could function satisfactorily. The implantation of the tantalum plate effects a permanent placement of the relaxed proximal third of the urethra and the adjacent bladder wall, far back into the pelvis, thus allowing, according to Kennedy, a complete functional restoration of the relaxed muscle of micturition.

Ten patients with urinary stress incontinence were carefully studied preoperatively by cystoscopic and cystographic examinations, as well as fractional filling of the bladder to determine the degree of bladder control. Only patients with severe stress incontinence were selected for the tantalum plate

operation. Four of the patients were operated upon for the first time, while six had had previous operations with failures.

The operative procedure is as follows:

The mucosa of the anterior vaginal wall is incised in the midline starting about 0.5 centimeter from the external urethral meatus and extending to the cervix. The mucosa is reflected by sharp dissection and the bladder, bladder neck, and urethra exposed. The bladder, as well as the urethra, are mobilized so that the index finger can be passed behind the descending rami of the os pubis. The cystocele is repaired by placing two Kelly sutures at the bladder neck and imbricating the vesicovaginal fascia (Figs. 2 and 3). By this procedure the bladder floor is well elevated and the urethra replaced to its normal

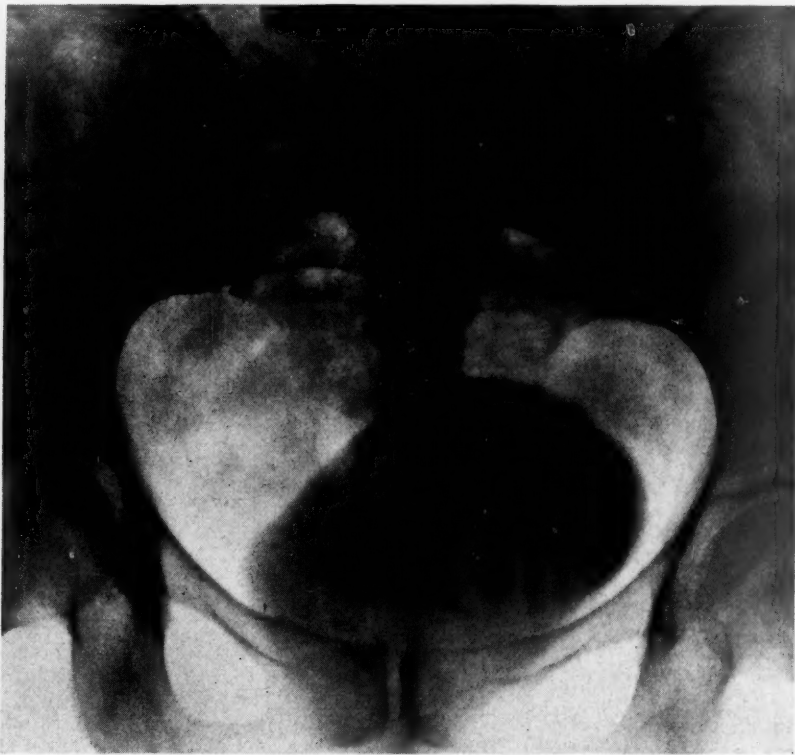


Fig. 5.—Preoperative cystogram, on straining, demonstrating marked funneling of the bladder base toward the urethra.

position beneath the pubic arch. A tantalum plate 0.004 inch in thickness and of proper length is then selected and placed beneath the inner third of the urethra and the vesicourethral junction. The position of the tantalum fixation sutures is determined and the plate removed. A tantalum suture 0.015 inch in diameter on a heavy cutting edged needle is then passed through the tissues and periosteum on the inner aspect of the descending rami of the os pubis. When properly placed, these sutures do not have any give on firm traction. The sutures are threaded through previously prepared holes at the ends of the tantalum plate, which is then placed at the vesicourethral junction. The wire sutures are tied firmly and the plate pulled snugly under the urethra and bladder neck, thus producing a permanent fixed plane. The tantalum sutures

are then cut short and the ends turned in against the plate (Fig. 4). The redundant vaginal mucosa is excised and the anterior vaginal wall closed with interrupted No. 0 chromic sutures. If necessary, the operation is completed by a posterior colpoperineoplasty. An indwelling catheter is inserted and the vagina packed with gauze.

In one case, as a test, no imbrication of the urethra was performed. The plate was implanted at the vesicourethral junction and the anterior vaginal wall closed. The functional result in this case was equally as good as in the other nine cases.

It is known that the distance between the pubic rami varies in different patients. Therefore, it is essential to use a plate of proper length to obtain the required urethral fixation and support. The size most frequently used measures $1\frac{1}{8}$ inches in length and $\frac{5}{16}$ of an inch in width.



Fig. 6.—Postoperative cystogram, on straining, demonstrating the tantalum plate in place behind the pubis and the restoration of the normal bladder contour.

The postoperative course of all the patients was uneventful. There was no evidence that the tantalum plate caused any irritation. Six of the ten patients voided spontaneously after the removal of the indwelling catheter. In one case, the patient required repeated catheterization because of the presence of a large amount of residual urine after voiding. All the patients were followed up by cystoscopy, cystography (Figs. 5 and 6), and fractional filling of the bladder, and all had good anatomic and functional results. Examination before discharge on the eleventh or twelfth day revealed healing of the anterior vaginal wall by primary union. In no case was there abnormal residual urine present after voiding. There has been no recurrence of inconti-

nence in any of the ten patients to date. On follow-up examination eight months after operation, the anterior vaginal walls were well elevated, and the plates could not be felt by the examining finger. There have been no complaints of pain or any discomfort on coitus.

Summary

Injury to the urogenital diaphragm results in impairment of the support of the urethra with relaxation and funneling of its proximal portion. This leads to extension of the bladder cavity into the proximal portion of the urethra. The damage to the internal sphincter involves primarily the inferior sphincter loop, while the superior sphincter loop may still function enough to effect some degree of bladder control. Hence, the amount of bladder control that the superior loop can accomplish by its approximation of the anterior to the posterior urethral wall will depend on the degree of saculation of the posterior urethral wall and extent of sphincter damage.

We feel that there is a common anatomic principle involved in all plastic operative procedures devised for the cure of urinary stress incontinence, e.g., replacement of the proximal portion of the urethra beneath the pubic arch, and the formation of a fixed plane at the posterior urethral wall. In this way, the approximation of the anterior toward the posterior wall is made possible, resulting in bladder control.

Relaxation of the fixed plane results in recurrence of stress incontinence. Implantation of a tantalum plate as described, produces a permanent fixed posterior urethral plane, against which approximation of the anterior urethral wall is effected by the contraction of intact superior sphincter loop.

Conclusions

1. Urinary stress incontinence is due to damage to the urethral supports and the sphincter muscles.
2. Injury to the urogenital diaphragm and inferior sphincter loop are the principal causes of urinary stress incontinence.
3. An analysis of the plastic operative procedures is presented.
4. The principle involved for the cure of urinary stress incontinence is common to all of them, e.g., replacement of the sacculated posterior urethral wall and the formation of a fixed posterior urethral plane.
5. Implantation of a tantalum plate produces a permanent fixed posterior urethral plane with good functional results. The simplicity and ease of the operation described merits its use.
6. No ill effects due to foreign body reaction have been observed.
7. Implantation of a tantalum plate has been used successfully in ten cases of urinary stress incontinence.

Addendum

Since this paper was submitted, an additional eight patients with stress incontinence were operated upon with a tantalum plate implantation. Six of these patients had had previous operative procedures for urinary incontinence and two were primary cases with severe degrees of stress incontinence. The results in all these cases have been completely satisfactory.

The follow-up on the ten cases reported in the text is now over one year and all the patients have normal bladder function. There has been no recurrence of urinary incontinence in any case.

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LOW SPINAL NUPERCAINE ANESTHESIA IN OBSTETRICS

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THE ideal obstetric analgesic agent is the one which will provide absolute safety for both the fetus and the mother, as well as complete subjective comfort without the undesirable side-effects such as interference with the progress of labor, paralyses of the extremities, drug reactions, and the like. From the standpoint of maximum safety for the fetus, there is no method superior to spinal or caudal analgesia because toxicologic drug reaction and depression are absent, and the trauma resulting from the "bearing down" efforts of the mother is eliminated.

Pitkin and McCormack¹ in 1928 published their "Controllable Spinal Anesthesia in Obstetrics" based on the use of a hyperbaric spinal anesthetic mixture containing 20 mg. of procaine injected into the lower portion of the dural sac to produce a saddle-perineal anesthesia. Lull and Hingson in their book, *Control of Pain in Childbirth*,² reported success with continuous spinal analgesia utilizing minimal doses of metycaine (15 to 22.5 mg. in Ringer's solution) administered in the first or second lumbar interspace. More recently, Adriani and Roman-Vega³ have added glucose to the nupercaine solution to make the mixture hyperbaric, and they control the level of anesthesia by varying the length of time the patient is permitted to remain in a sitting position after injection of the mixture. Parmley and Adriani⁴ have applied this technique to obtain obstetric analgesia and anesthesia.

Pharmacology.—Nupercaine is a complex amine derivative of quinoline. It forms hygroscopic crystals which are colorless, odorless, and tasteless, are readily soluble in water and alcohol, and which form a stable aqueous solution which may be repeatedly boiled without deterioration. *Nupercaine in aqueous solution, however, is precipitated in the form of insoluble base by contact with the slightest amount of alkali.* It is, therefore, advisable to rinse needles and syringes to be used with it with a small amount of nupercaine or weak hydrochloric acid solution, in order to guard against the accidental presence of alkali. Nupercaine has a selective affinity for nervous tissue, paralyzing the peripheral nerves without initial stimulation. Both its potency and toxicity are high, and hence it should be used in a greater dilution and lower total dosage than the other slower acting spinal anesthetic agents. The rapidity with which the anesthesia becomes established varies with the dilution used.⁵ Intrathecal injection of "heavy nupercaine" solution in man usually produces the onset of anesthesia in two to five minutes, although occasionally as long as ten minutes may be required.⁶ The average duration of effective anesthesia is three to four hours, and at times as long as six hours.⁷

Toxicity

The general symptoms of acute nupercaine intoxication are similar to those produced by other anesthetic drugs: initial depression, followed by nervous excitement with loss of coordination, progressing to a stage of clonic convulsions and ultimate death.

Contraindications

The use of spinal anesthesia is contraindicated in the presence of the following conditions:

1. Diseases of the cerebrospinal system and the spinal column.
2. The presence of pyogenic infection at or adjacent to the prospective site of puncture.
3. Poor condition of the patient, viz., shock, coma, sepsis, and/or severe hypotension.
4. Obstetric complications such as placenta previa, abruptio placenta, fetopelvic disproportion, and high position of the presenting part.
5. Hypersensitivity to the drug.
6. Unfavorable types of patients. (a) Those suffering with chronic backache, headache, or migraine. They may develop an exacerbation or recurrence following the use of spinal injection. (b) Those desiring to be asleep.

Material Studied

Since July 1, 1943, more than 1,500 caudal anesthetics, and since Sept. 6, 1946, 500 low spinal anesthetics have been administered at the three hospitals (Lewis Memorial Maternity Hospital, St. Vincent's Infant and Maternity Hospital, and Mercy Hospital, Chicago) in the obstetric departments under the supervision of Dr. Herbert E. Schmitz. This paper presents the results of our study of 375 cases of low spinal anesthesia at Lewis Memorial Maternity Hospital.

The patients were carefully evaluated as to contraindicating factors (fetopelvic relation, drug sensitivity, etc.), the type of presentation, the station of the presenting part, the cervical dilatation and effacement, and the progress of labor. The "heavy nupercaine" solution was given when delivery was thought to be imminent within the next three hours. The selection of the time was based on our desire to minimize the number of spinal administrations necessary to carry the patient comfortably through the delivery and was dependent on two sets of facts:

1. Perineal anesthesia will usually last for more than three hours, but the abdominal discomfort will recur earlier and may necessitate another injection for relief of abdominal distress.
2. In view of the satisfactory analgesia produced by drugs such as morphine, morphine-scopolamine, demerol, demerol-scopolamine, barbiturates and barbiturates in combination with morphine, demerol, scopolamine, etc., the early first stage of labor may be best treated by such medications and the spinal method reserved for the late first stage and the second stage.

Technique

Before administering any nupercaine as an anesthetic agent the patient was tested for sensitivity to the drug. The test was made by injecting 0.1 to 0.2 c.c. intradermally or by instilling 4 or 5 drops into the nostril.

The nupercaine solution to be used for anesthesia was made hyperbaric by mixing the 1:200 solution of nupercaine with an equal volume of 10 per cent glucose solution. The resulting mixture contained 2.5 mg. of nupercaine per 1 c.c. of 5 per cent glucose solution. This "heavy nupercaine" solution was injected intrathecally at the level of the third or fourth lumbar interspace with the patient sitting up. After thirty seconds, the patient was placed flat on her back but with the head propped up with pillows. The onset of analgesia was usually immediate.

To minimize the chances for failure, the following precautions were observed: First the possible presence of alkali which would precipitate the nuper-

caine was eliminated by using syringes and needles which had been rinsed in weak hydrochloric acid solution prior to autoclave sterilization. Second, great care was taken to have the point of the needle completely intrathecal as partial loss of the nupercaine solution extradurally would contribute to the failure. Third, injection was not made during uterine contraction as the increased spinal fluid pressure establishes a current in the subarachnoid space which may carry the solution upward.

Results

The results of our observations are summarized in Tables I to IX. Evaluation based on subjective relief was necessary since the establishment of a saddle-perineal area of anesthesia did not always mean complete relief of abdominal distress. The patient judged the success of the anesthesia on the basis of her relief from pain and not on the level of the anesthesia. We, therefore, have had to classify as "incompletely relieved" those patients in whom the saddle anesthesia was present but who felt some pain (although diminution of pain was quite marked).

There were three failures in our series. These patients stated that they had absolutely no alleviation of their distress. In two patients, the dose was 1.0 c.c. (2.5 mg.) and in one patient, the dose was 1.4 c.c. (3.5 mg.). The spinal injection was not repeated.

Of the 13 patients listed as "incompletely relieved," 11 had complete perineal anesthesia and marked diminution of abdominal discomfort. The residual distress varied from supra-pubic "sensation" to mild cramping. In 8 of the 11, supplementary anesthesia was unnecessary, but the other three were given inhalation anesthesia at the time of delivery. These three cases are summarized here:

No. 22.—A 21-year-old para ii was given 2.5 mg. of nupercaine in the late first stage, 1 hour, 18 minutes before delivery, resulting in complete perineal anesthesia and diminished pain, but for delivery light cyclopropane anesthesia was necessary. Spinal anesthesia was sufficient for episiotomy and episiorrhaphy.

No. 117.—A 33-year-old para iii was given 2.5 mg. of nupercaine 44 minutes before delivery with resultant complete relief, but as she wanted to be asleep at the time of delivery, she raised a commotion when supplementary anesthesia could not be given in time for the spontaneous delivery. Patient had complete paralysis of the legs.

No. 287.—A 28-year-old para i was given 2.5 mg. of nupercaine 2 hours before delivery with resulting complete perineal anesthesia but residual abdominal pain. Given light cyclopropane anesthesia for delivery, but episiotomy and episiorrhaphy were done under spinal anesthesia alone.

In all 11 patients, the episiotomy and episiorrhaphy were performed under the effect of spinal anesthesia alone.

In the two remaining cases of incomplete relief, the anesthesia effects did not last one hour and supplemental anesthesia was required. The cases are summarized:

No. 118.—A 32-year-old para ii was given 2.5 mg. of nupercaine 3 hours, 50 minutes before and 5.0 mg. 1 hour, 40 minutes before the delivery (both given during first stage). Effect did not last 1 hour and pudendal block was required for the delivery and repair.

No. 353.—A 20-year-old para i was given 2.5 mg. of nupercaine 3 hours, 24 minutes before the delivery, but the spinal anesthesia effect disappeared within 30 minutes. Delivery and episiorrhaphy under cyclopropane anesthesia.

Another case which may be properly included here was the patient who obtained complete relief with initial injection but not with the second injection.

TABLE I. NUMBER OF CASES STUDIED

Total number of low spinal cases		375
Total number with complete subjective relief for at least one hour		359
Cases with complete relief with one injection	328	
Cases with complete relief with two injections	31	
Cases with complete relief after each of two injections	23	
Cases with incomplete relief with first but complete after second injection	5	
Cases with complete relief with first but incomplete with second injection	3	
Total number of incomplete relief cases		13
Cases with incomplete relief after one injection	12	
Cases with incomplete relief after each of two injections	1	
Total number of complete failures		3

No. 259.—A 20-year-old para i was given 2.5 mg. of nupercaine 4 hours, 20 minutes before delivery, and a second 2.5 mg. 1 hour, 10 minutes before delivery. Complete relief followed the initial dose, but the subsequent dose provided only about 75 per cent relief, so that ether was given for the delivery and repair.

For practical purposes, therefore, satisfactory relief (comfortable delivery or alleviation of distress for at least one hour) was obtained in 370 of the 375 patients.

The dosage, the time of administration, and the interval between the time of last injection and the delivery are shown in Table II. The parity, the presentation, and the position are shown in Table III. In Table IV is listed the reasons for the administration of supplementary delivery anesthesia. Table V gives the interval between the time of last spinal injection and the time of the delivery anesthesia. For operative deliveries such as forceps rotation, mid-forceps extraction, breech extraction, and version and extraction, the use of deeper anesthesia is a routine procedure. This is in keeping with the observation of Malpas⁸ of Liverpool during laparotomy and cesarean section that under spinal anesthesia the myometrium of the pregnant uterus exhibits heightened reactivity to various stimuli.

TABLE II. DOSAGE, TIME OF INJECTION, AND INTERVAL BEFORE DELIVERY

Dosage:	
Number of cases given 1.0 c.c. per injection	230
Number of cases given 1.4 c.c. per injection	118
Number of cases given 2.0 c.c. per injection	27
	375
Time of administration:	
Stage of labor when spinal anesthesia started:	
Stage at initial injection	
Late first stage	275
Second stage	100
	375
Stage at subsequent injection	
Later first stage	11
Second stage	21
	32
Interval between time of last injection and delivery:	
Less than 1 hour	122
Between 1 hour and 1½ hours	76
Between 1½ hours and 2 hours	60
Between 2 hours and 3 hours	63
More than 3 hours	54
	375

TABLE III. PARITY, PRESENTATIONS AND POSITIONS

Parity:		
Primiparas—144	Multiparas—231	Total—375
Presentations and Positions:		
Cephalic presentations		363
Occiput anterior		304
OA	5	
OLA	168	
ORA	131	
Occiput transverse		17
OLT (Spontaneous rotation)	2	
OLT (Manual rotation)	4	
ORT (Manual rotation)	4	
ORT (Forceps rotation)	7	
Occiput posterior		42
OLP (Spontaneous rotation)	2	
ORP (Spontaneous rotation)	5	
OLP (Manual rotation)	1	
ORP (Manual rotation)	9	
OLP (Forceps rotation)	2	
ORP (Forceps rotation)	9	
OP (Spontaneous rotation)	1	
OP (Manual rotation)	1	
OP (Forceps rotation)	1	
OP (Delivered as such)	11	
Breech presentations		11
SLT (Manual aid)	1	
SLP (Manual aid)	1	
SLT (Footling, manual aid)	2	
SRT (Footling, manual aid)	1	
SRA (Footling, manual aid)	2	
SLT (Breech extraction)	2	
SRT (Breech extraction)	1	
SRA (Breech extraction)	1	
Face presentation		1
MRT (Bag induction and version and extraction)		
Twins—5 sets		

In one of our cases version and extraction was performed in a patient with a face presentation in whom a Voorhees bag had been inserted twelve hours after the rupture of the membranes. Spinal anesthesia was given after the onset of pain and three hours before delivery. The patient was perfectly comfortable, the progressive dilatation of the cervix was easily followed. The Voorhees bag was eventually but gently extruded into the vagina, decompressed, and removed and followed with delivery by version and extraction under supplementary deep ether delivery anesthesia. Perineal anesthesia was complete at the time of delivery.

The duration of subjective relief varied, but the average range was one to two hours. The objective anesthetic effect, however, generally exceeded three hours. The longest anesthetic effect (enough to permit episiorrhaphy) was noted 10 hours after the last injection in one patient and 7 hours, 22 minutes in another.

Untoward Effects

As shown in Table VI, motor weakness to complete paralysis of the lower extremities was present in all of the 375 cases. This is in contrast to the claims of other workers who have reported successful saddle block anesthesia and obstetric analgesia without impairment of the function of the lower extremities.

The effect on the blood pressure is depicted in Tables VI, VII, and VIII. In 221 patients, the difference between the pre- and postinjection reading was less than 10 mm. Hg. Of the 67 patients showing a drop in pressure exceeding 20 mm., only 13 had hypotension requiring the administration of ephedrine. The prophylactic use of ephedrine may prevent the hypotension, but the low

TABLE IV. ANALYSES OF THE 375 CASES

Cases delivered solely under the effect of spinal anesthesia		315
Cases requiring supplementary anesthesia for second stage		60
Very light (for psychological reasons only)	10	
Prophylactic deeper anesthesia for operative maneuvers	1	
Forceps rotations	2	
Midforceps delivery	1	
Breech extraction	6	
Version and extraction	2	
Anesthesia to supplement waning spinal effect		33
Where only "whiffs" of gas or ether required	6	
For delivery only, repair under spinal effect	10	
Failure to give second spinal injection	9	
Failure to give third spinal injection	3	
Contraindications to subsequent injections:		
Drug reaction (later found to be due to demerol sensitivity)	1	
Febrile course	1	
Incomplete relief after second injection	3	
To supplement incomplete spinal effect		3
Complete failure		3

incidence of hypotension requiring stimulation (0.34 per cent here) and the ready response evoked by the ephedrine when used indicate that therapeutic rather than routine prophylactic administration of ephedrine should be practiced.

Fetal bradycardia may accompany the sudden hypotension resulting from spinal anesthesia and signify fetal anoxemia. Administration of oxygen to the mother promptly corrects the fetal bradycardia.

TABLE V. TIME OF SUPPLEMENTARY ANESTHESIA

Number of cases requiring supplementary anesthesia in deliveries occurring:		
Within one hour after the last injection		5
Psychological requirement only	1	
Prophylactic supplement for breech extraction	1	
Supplement waning spinal effect	1	
Supplement the incomplete relief from spinal anesthesia (Effect wore off in 10 to 15 minutes)	2	
Between 1 hour and 1½ hours after the last injection		9
Psychological requirement only	4	
Prophylactic supplement for breech extraction	1	
Supplement waning spinal effect	2	
Complete subsidence of the spinal anesthesia	1	
Incomplete relief following the 2nd injection	1	
Between 1½ hours and 2 hours after the last injection		4
Psychological requirement only	3	
Supplement waning spinal effect	1	
Between 2 hours and 3 hours		14
Psychological requirement only	3	
Prophylactic supplement for operative maneuvers	5	
Version and extraction on twin No. 2	1	
Scanzoni maneuvers	3	
Breech (frank) extraction	1	
Supplement waning spinal effect	5	
Complete subsidence of spinal anesthesia	1	
Over 3 hours after the last injection		25
Effective perineal anesthesia at delivery	13	
3 to 4 hours after the last injection	7	
4 to 5 hours after the last injection	1	
5 to 6 hours after the last injection	3	
7 hours and 22 min. after last injection	1	
10 hours after the last injection	1	
Complete subsidence of spinal effect by delivery time	12	
Number of cases of complete failure (no relief at all)		3
Total number of cases given anesthetics at the time of delivery		60

TABLE VI. UNTOWARD EFFECTS OF SPINAL ANESTHESIA

Motor weakness to complete paralyses of the legs		100.0 %
Spinal reactions	1 case	0.26%
Effects on the blood pressure:		
No change (increase, no change or fall less than 5 mm. Hg)	148	39.5 %
Fall between 5 to 10 mm. Hg	73	19.4 %
Fall between 10 to 20 mm. Hg	87	23.2 %
Fall over 20 mm. Hg	67	17.8 %
	<hr/> 375	
Post-spinal headaches	52	13.8 %
Foot drop	1	0.26%
Retained placenta (not due to spinal anesthesia)	1	0.26%

TABLE VII. ANALYSES OF CASES WITH BLOOD PRESSURE FALL OVER 20 MM. Hg

Cases not requiring ephedrine	54
Cases requiring ephedrine	13
	<hr/> 67

TABLE VIII. ANALYSES OF CASES WITH BLOOD PRESSURE FALL BELOW 100 MM. SYSTOLIC PRESSURE

Fall to level between 100 to 90 mm. Hg.	19
Fall to level between 90 to 80 mm. Hg.	15
Fall to level less than 80 mm. Hg.	3
	<hr/> 37

TABLE IX. OCCURRENCE OF POSTSPINAL HEADACHES

Day of delivery	3
After 12 hours	9
After 24 hours	8
Third day	14
Fourth day	12
Fifth day	4
Sixth day	2
	<hr/> 52

Of the so-called "reactions," there were two. In one, the reaction was later proved to be attributable to demerol sensitivity, but in the other the spinal anesthetic agent was the cause. The cases are summarized.

No. 79.—A 25-year-old para ii was given 100 mg. of demerol 30 minutes preceding the spinal injection. At the time of the spinal anesthesia administration, the patient's pallor was noted, but passed over as insignificant. Thirty minutes later, she was found pale and covered with cold perspiration, with a hypotension of 75/55. She was treated with ephedrine with good response. Demerol sensitivity was suspected on the basis of the pallor preceding the spinal injection, and hence skin test was made which resulted in the development of erythema and urticaria at the injection site of the demerol but not at that of the nupercaine or the control saline solution.

No. 47.—A 26-year-old para iii was given 2.5 mg. of nupercaine at the late first stage (2¼ hours before delivery). The patient developed pallor, bradycardia to 50-60/min., hypotension of 80/0, and irregular fetal heart tones, but claimed no vertigo, dizziness, difficulties, etc. She was given 25 mg. of ephedrine, oxygen, and later 1 c.c. of coramine. Improved in 10 minutes. Obstetric analgesia and anesthesia were complete.

These two cases emphasize the need for routine testing for sensitivity.

Neurologic complications in spinal anesthesia as have been pointed out recently by Nicholson and Eversole⁹ are always potentially present. One case of foot drop is here presented.

No. 258.—A 29-year-old para iii was given 2.5 mg. of nupercaine 6 hours, 51 minutes, and again 1 hour and fifty-one minutes before delivery. Following initial injection, blood pressure fell to 34/14 mm. Hg, but responded promptly to ephedrine administration. No other unusual manifestation. Complete relief lasted only 45 minutes but partial relief for an additional hour. Complete relief with second injection and delivery and episiorrhaphy were uneventful.

She was allowed up on the third day but noted numbness of the right foot and calf, weakness of the right knee and ankle on walking. There was loss of dorsiflexion, inversion-eversion motions, and hyperesthesia was present over the dorsal-medial aspect of the right foot and ankle. Neurosurgical opinion was that the findings suggested localized injury to right L5 root.

To guard against neurologic complications, the following conditions should be met: (1) that the apparatus be scrupulously clean, (2) that the solution be free of deterioration and impurities, and (3) that no injection be made if the spinal puncture causes radiating pain or yields a bloody tap, as trauma to the nerve or cord may be produced as illustrated (these precautions, of course, are in addition to the contraindications previously listed).

Postspinal headache was another undesirable side-effect. Fifty-two patients developed headaches on the days indicated in Table IX. The headache was most frequently located in the upper cervical and suboccipital region, and to less extent over the frontal area. The headache was found to occur particularly on the day that the patient was permitted out of bed. That this headache may not be due to the anesthetic agent itself is indicated by the incidence of typical headaches following diagnostic spinal taps alone. Our incidence of postspinal headaches has dropped following the adoption of two precautionary measures: (1) minimizing the spinal fluid loss at the time of spinal puncture, and (2) early assumption of the near-upright position from the day of delivery.

Retained placenta occurred in one case, but as this patient had had retained placenta with her previous pregnancy, this cannot be truly classed as a complication of spinal anesthesia.

No. 344.—A 25-year-old para iv had had manual removal of retained placenta with her third delivery in 1944. She suffered much blood loss before the placenta was removed, and hence received 2 blood transfusions.

With this present delivery, 2.5 mg. of nupercaine were given 1 hour, 13 minutes before delivery. The placenta was retained and, because of persistent bleeding, manual removal was done. The placenta was adherent. Blood loss was about 500 cubic centimeters.

Comment

Spinal anesthesia presents advantages to the fetus, the laboring mother, the hospital staff, and the attending physician. For the fetus, spinal anesthesia provides maximum protection from two standpoints. Pharmacologically, the toxicologic drug reaction and depression to the baby are absent. Mechanically, the trauma to the baby's head is minimized by the elimination of the "bearing down" reflex; the cervix is dilated only by the action of the uterine contractions.

For the laboring mother, it provides absolute comfort. The patient is relieved of a great deal of pain almost immediately on injection of the hyperbaric solution. The prolonged analgesic and anesthetic effects of nupercaine allow

the patient to be carried through part of the first stage and all of the second and third stages with the minimum of discomfort. Because of the comfort, the patient is able to take adequate nourishment and fluids.

For the nursing staff, the care of the patient is made easy. Only the minimal equipment is required for the spinal injection in contrast to caudal anesthesia, and the nursing care is reduced to a minimum. Furthermore, the "last minute" confusion and excitement is eliminated as the time of delivery can be accurately predicted in the last hour.

From the physician's standpoint the advantages are many. Spinal anesthesia is the anesthetic of choice in cardiac patients, as well as in patients suffering from respiratory diseases, acute or chronic (e.g., tuberculosis, pneumoconiosis, bronchiectasis, asthma, upper respiratory tract infections, etc.). Furthermore, the danger of aspiration complications, often present in inhalation anesthetics, is eliminated. The use of low spinal anesthetics in patients given heavy pre-delivery sedation will save both the mother and the fetus, the additional narcotizing effect of the supplementary delivery anesthesia. Another advantage to the physician is the simplicity of administration.

The disadvantages of spinal anesthesia lie in the possible development of complications. The most important of these are the neurologic complications. Neurologic complications may follow general, as well as spinal anesthesia. Woltman¹⁰ found that convulsions, extrapyramidal rigidity, and postoperative psychosis followed general anesthesia almost exclusively. Courville¹¹ has shown that the anoxic hypoxia associated with weak anesthetic agents such as nitrous oxide and ethylene can cause degenerative changes in the cerebral cortex and lenticular nucleus. On the other hand, cauda equina syndrome, myelitis, neuritis, arachnoiditis, and septic and aseptic meningitis may follow spinal anesthesia. Scrupulous technique, using pure drugs in proper dilutions and vehicles, avoiding trauma at the time of injection, and selecting patients presenting no contraindications to the use of spinal anesthesia should reduce this danger to the minimum.

Drug reactions can be avoided by careful evaluation of histories followed by the skin or nostril test for sensitivity. The most common complication is the postspinal headache. This incidence can be reduced by withdrawing as little spinal fluid as possible at the time of puncture, by the early assumption of the sitting position, and early ambulation. Motor weakness during the anesthesia is transient and causes but slight inconvenience.

Summary

Three hundred seventy-five patients were given small doses of hyperbaric nupercaine solution to produce low spinal anesthesia. It provided satisfactory analgesia of at least one hour's duration in 370 patients. Perineal anesthesia, permitting episiotomy and episiorrhaphy, lasted on the average three to four hours, but in a few cases was found to be present as long as seven to ten hours. Recurrence of abdominal pain, however, appeared after two to three hours, and in some cases within two hours. Complementary and supplementary injections were generally more effective over a longer duration than the initial administra-

tion. Hypotension requiring the use of ephedrine occurred in 13 patients and of the 13, two developed "reactions" (hypotension, bradycardia pallor, cold sweats, and fetal heart irregularity) which responded satisfactorily to the administration of oxygen and ephedrine. In all of the 375 patients some motor weakness was present. The area of anesthesia and hypesthesia described a saddle pattern over the legs and perineum and extended over the abdomen to various segmental levels, for the most part below the level of XI thoracic nerve. Blood loss at the time of delivery was usually small but, as the minimal dose of nupercaine was not always used, no conclusions can be drawn. In all cases except six the babies were awake, breathed, and cried as soon as the heads were delivered. There were three stillbirths. In two cases, the patient gave birth to twins, in each of which one twin was a macerated stillborn infant. In both of these cases the labors were premature. Fifty-two patients developed headaches on various days of the puerperium. A neurologic complication, in the form of foot drop, occurred once.

Conclusion

Low spinal anesthesia and analgesia for parturition is definitely satisfactory to the patient and her relatives, to the nursing staff, and to the obstetrician because of the dramatic and effective relief of the discomfort of labor, the maximum safety it provides the fetus and the mother, and the simplicity of the technique which utilizes a minimum of paraphernalia. That there are certain dangers to its use must be borne in mind at all times. Protracted or permanent neurologic complications may follow spinal anesthesia as well as general anesthesia. Drug reactions may endanger the fetus and the mother. It is, therefore, imperative that the most careful technique be closely observed.

Since the advantages are many and the disadvantages few, it is our belief that low spinal anesthesia is the anesthesia of choice in obstetrics.

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THE PSYCHIC COMPONENT OF PAIN IN GYNECOLOGY AND OBSTETRICS*

A Sensory Conditioning Process

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THE ever-crying need for more doctors, more nurses, and bigger and better hospitals will continue until all doctors come to realize that many of the afflictions of humanity are either disorders or distorted interpretations of sensory perception and not symptoms of structural or organic pathology.

Prevalence of Psychosomatic Factors

Cooke,¹ in his Chairman's address before the 1945 American Association of Obstetricians and Gynecologists and Abdominal Surgeons, stated, "The psychology factor is more important than the physical and functional pathology, . . . and 95 per cent of the severity of human suffering is mental." Bowman,² in an address before the 1946 General Scientific Assembly of the American Medical Association at San Francisco, estimated that 50 per cent of all cases seen in general medical clinics are primarily psychiatric problems, most of which would be labeled neuroses. Parran³ reported in February, 1947, that there are 8,000,000 psychically ailing Americans in urgent need of care. Read,⁴ in his book *Childbirth Without Fear*, is convinced that the most of the discomforts of pregnancy and pain of childbirth are products of our culture.

Heyns⁵ calls attention to the absence of psychosomatic complaints in primitive woman. In his article, "The Superiority of the South African Negro as a Parturient," he makes this statement: "There is present a fortitude and an acceptance of the situation such as is rarely seen in the European, and hardly ever seen in the latter when cases of dystocia alone are considered." Aaberg,⁶ who has just returned from Guam, reports that nausea and vomiting is rarely, if ever, present in the primitive woman; that the pain of childbirth is of no importance until the native comes in contact with culture.

Bennett,⁷ in a paper on "Faulty Management of Psychiatric Syndromes Simulating Organic Disease," investigated the case histories of 150 neurotic patients and found they had been subjected to 496 medical treatments, 244 surgical treatments, and 71 admitted cultist treatments; a total of 811 therapies prior to any psychiatric attention. Alvarez, Mackay, and Menninger, in a discussion of Bennett's paper, blame such mismanagement upon faulty medical education, laziness, lack of imagination, and a worship of technical and chemical procedures on the part of the physician.

There are, however, a certain number of diligent doctors who, because they meet with a certain amount of success by the use of their particular therapy, find it expedient to continue the use of therapies which for the most part are approved medical and surgical placebos. There are also some sincere physicians who through biased medical training interpret pathology where no actual pathology exists.⁹ They are continually finding what they are looking for and

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ignoring anything that is contrary to their expectations, their opinions or their convictions. This is often true of various specialists and invariably true of most cult healers.

It is not difficult for the gynecologist and obstetrician to detect the fully developed psychoneurotic patient after a few minutes' conversation, but to detect the prodromal symptoms or the incipient stage takes time and patience. As a matter of fact, there is no such thing as an exact line between functional and organic symptoms. It is merely a matter of degree. All organic ailments have functional modifications, and functional disorders can produce organic changes.

Development of Neuroses

The masses, through shorter working hours, possess the gift of leisure without much preparation for the enjoyment of it. The human being, by nature introspective, quickly focuses his spare attention upon that most precious of his possessions—his body. He discovers vague pains which begin to harass him. The more profound his concentration, the more severe becomes his agony. Listening to the radio or reading the paper tends to exaggerate his preoccupation with the cenesthetic functioning of his body. Every hour of the day he is startled into searching for new symptoms. The public easily manifests the symptomatology it hears discussed; agrees with the popular complaint regarding the need for more doctors, nurses, and hospitals; feels the whole population is entitled to the most lavish medical care. The fact that the severity of his pain may be psychic in origin is either unintelligible to the average man or simply incredible. To the sufferer his pain is very real. He wants relief.

Psychobiology of Pain

It is astonishing how little use is made of pain in establishing a diagnosis, or directing the management of a disorder. We have passed through a period in which pain was always considered a symptom secondary to tissue pathology, and are now beginning to regard it in its true sense as a sensory perception. Until the medical profession as a body becomes habituated to the idea that there is an important *difference* between the patient's perception of pain and his reaction to painful experience with its autonomic, emotional, and other components, confusion is bound to persist. Once this difference is accepted, the reactions to pain such as sweating, tachycardia, dyspnea, anorexia, intestinal disturbances, *as well as* anxiety, fear, panic, fatigue, and prostration can be evaluated and better managed.

Lewis,¹⁰ who has spent a lifetime in the study of pain, says, "Pain cannot be defined; it is something we learn from experience and describe by illustration."

The function of the sensory nervous system is to acquaint the conscious mind with the nature of the external and internal environment—light, odor, taste, sound, pain, temperature, and pressure—in order to regulate autonomic processes and coordinate muscular movement. The newborn infant is unaware of the first noxious stimulus, but by repetition and spatial summation preception occurs, and in time is projected to the definite area of irritation. Also, it

should be remembered that cortical cells have the function of spontaneous activity, and that pain can appear spontaneously through association with some previous painful experience. For instance, the hypnotist through suggestion is able to reinstate the vivid pain of toothache only if his subject has once experienced such toothache.

Using college students as subjects, laboratory investigators have found that the constant repetition of painful electrical stimuli to the skin would continue to produce the sensation of pain in the skin after about the 200th application, even though the stimulus was only feigned. In other words, once a subject's pain perception becomes associated with the mechanical apparatus, the sight and click of the mechanism alone are sufficient to produce the sensation previously initiated.

As with all cells a threshold stimulus is necessary for excitation. Hardy, Wolff, and Goodell,¹¹ and others have found the pain threshold rather constant in the unprejudiced subject. If this were not the case subliminal impulses would reach consciousness and we would be continuously annoyed by the normal activities of the body.

If the above phenomenon were constant all individuals would perceive pain alike, and the reactions to pain would be in direct proportion to the stimuli applied. Unfortunately, or fortunately, as the case may be, the perception of pain is affected by the attitude of the patient, so that in combat or in games in intense excitement the participants are often unaware of severe injury, the apprehensive individual may suffer pain even before being touched.

Haman¹² has found that the pain threshold is slightly lower in dysmenorrhoeics and others who appear preternaturally sensitive.

The disparity, however slight, is often sufficient to cause one individual to feel impulses of pain to which another would remain indifferent. Once impulses are recognized as painful they become associated or integrated with previous and coincidental environment. Repetition tends to strengthen these connections so that mosaic patterns of excitation or inhibition are created in the cerebral cortex—patterns which profoundly alter the bodily reactions. This process of learning to feel pain is analogous to the same sensory conditioning process inherent in other learning and reasoning—like learning to speak or to appreciate music.

Some persons so strongly identify events, objects, smells, taste, or noises with painful experiences that every time they subsequently encounter a like event, object, or sensation, a painful reaction is felt. Thus the screech of a siren may cause pain and collapse in an individual who has recently experienced an automobile accident. This is known as *synthesia*. With this explanation we arrive at approximately the same conclusion as Read. A stimulus of a fixed magnitude applied to any specific sensory receptor produces a psychic sensation and a somatic reaction commensurate with the intensity of its interpretation.

It is normal, of course, for the human being to seek the cause for the painful impulses that register in his consciousness. It is only when he has exaggerated the pain by anticipation, concentration, or anxiety, to an intolerable point that his neurosis becomes abnormally troublesome to him and makes of him a misfit

in the social pattern. Proof of the psychic origin of many neuroses lies in the spectacular improvement of many patients—where the treatment administered is totally unrelated to either the complaint or to the diagnosis.

Illustrative Cases

CASE 1.—A dramatic example is a recent case of a missed abortion. Some time elapsed before a positive diagnosis was made. The patient's husband became apprehensive of her developing "blood poisoning." Evacuation of the uterus was accomplished with difficulty. For a month the patient complained of a putrid discharge, then delivered a fetal appendage. She became greatly alarmed, lost confidence in her physician, and began to develop pelvic pain and numbness in the left side of her body. Although no pathology could be found, she became worse. A consultant halfheartedly advised an exploratory laparotomy. The patient's alarm increased and her numbness changed to partial paralysis, which spread to the right arm. Also her abdominal pain increased. Her husband took the patient to another physician who deliberately convinced her that her pain and disability were caused by vascular constriction in the affected parts. She was assured release could be accomplished by three specific intravenous injections (glucocalcium). Urging the patient to watch for immediate flushing and a feeling of warmth over her entire body, to focus her whole attention upon her physical reaction to the injections, released her anxiety and produced the bodily response expected. Diagnosis; hysteria. Treatment: Reassurance with the aid of a placebo. Result: Immediate improvement, with complete relief within a week.

CASE 2.—This case is cited to demonstrate that full recovery of patients from troublesome symptoms may follow surgery where *no* pathology was found. A pregnant patient complained of pain in the right lower quadrant—a common enough symptom. At her prenatal visits her fears were temporarily allayed by rationalization and reassurance that it was believed the birth of her child would put an end to her symptoms. Subsequent to delivery, her symptoms recurred and continued to do so every three or four months. Her physician continued to use suggestion and persuasion to restore her confidence, but always with only temporary relief. At the end of a year the patient's husband telephoned to say he was firmly convinced his wife was suffering from chronic appendicitis. Without again seeing the patient her physician referred her to a surgeon who booked her for operation, requesting his assistance. In the dressing room the obstetrician asked the operating surgeon as a favor to impress the patient with the *severity* of her lesion—regardless of what he should find—and to convince her he had removed the trouble. Treatment: Removal of a normal appendix. Result: Immediate and permanent cessation of symptoms.

Conversely, definite pathology may be found and removed and the patient insist that her trouble and her pain continue.

CASE 3.—Mrs. J. W. had an offensive, persistent rectovaginal fistula. Over a period of years several unsuccessful attempts were made to close the opening. Finally the fistula was successfully closed. Nevertheless, the patient continued to feel unclean and insisted that intestinal gas and secretions still pass to the vagina. The most careful examinations by various doctors only temporarily convinced her that the fistula was closed.

Phantom Limb Pain

Perhaps a consideration of the pain of phantom limb will illustrate more effectively than any gynecologic case history that pain is not always where the

patient—and often his doctor—thinks it is. Wolff¹³ states that nervous stimulation is a centrally integrated experience projected onto the periphery for specific purpose of localization. The “skin spot” is a “mind spot.” In most amputation cases pain disappears with the proper healing of the stump. Yet surgeons everywhere and many among the laity are acquainted with amputees who complain for many months, sometimes throughout the remainder of life, of pain felt in the removed member. Neurectomy, rhizotomy, decortication of vessels, cordotomy, and intraspinal alcoholic injections are frequently employed, without relief, on the same patient. Such a patient may become addicted to alcohol, barbiturates, opiates, or he may even choose suicide in a desperate attempt to gain release from pain.

Any amputee will admit that he remains most acutely conscious of that part of his missing member upon which his attention was fixed often just previous to amputation. Livingston's¹⁴ railroad employee, who was attempting to remove gravel from the fingertips of his glove when struck by a train continued to feel the aggravation of the gravel at his missing fingertips more than the pain of amputation which had been performed at the shoulder.

Another amputee had undergone 13 surgical operations on the stump for the relief of phantom limb pain before van Wagenon of the Mayo Clinic severed the nerve connections between the cortex and the basal ganglion (lobotomy) and relieved the patient. This not only illustrated the inflexibility of some orthopedic surgeons, but should prove that *pain* is a perception—and as such becomes a function of the cerebral cortex. The fingers and toes, where there is the greatest concentration of sensory nerve terminals, naturally have the greatest representation in the cortex and so are most frequently the parts that give postamputation trouble.

Persistent pain in other parts of the body responds to lobotomy in the same way as phantom limb pain. Where pain patterns have become fixed by a long-continued sensory conditioning process, severance of the cortico-thalamic tracts often results in relief—even of such intractable pain as that of inoperable pelvic carcinoma.¹⁵ Freeman and Watts state that many patients report they still feel pain but in a different manner. The emotional factor is gone and along with it the persistent demand for narcotics.

Disorders of Perception

The psychic factors in gynecologic and obstetric disorders develop for the most part through exaggeration of normal physiologic impulses. By suggestion, persuasion, introspection, and fear some patients perceive subliminal impulses of which normally they would be unaware. Many individuals, unfortunately, are born with a lowered pain threshold and throughout their lives are considered by their friends hypersensitive, delicate, and neurotic.

Evaluation of Statistics

The mistakes that doctors make in the evaluation of statistics, which lead to the misdiagnosis and mismanagement of functionally ill persons, is the result

of biased thinking. Specialists in general are often so prejudiced by their own particular methods of therapy they frequently neglect to realize that not only do these methods fail of the desired effect . . . but indeed of any effect whatsoever. It is for this reason that the treatment for any psychosomatic ailment varies from decade to decade, but the percentage of relief obtained remains approximately the same. For instance, school children are subjected to removal of tonsils, yet the widespread practice of this operation has failed to lower the incidence of colds, arthritis, or heart disease. Doreus,¹⁶ in appraising the statistical results of approved medical procedures as applied to mental patients for the past one hundred years, has found that the percentage of relief has not improved.

Discussion and Conclusion

Most of the diseases that fifty years ago required the greater part of the physicians' time have been eradicated through improved hygiene and sanitation; through immunization, antibiotics, and chemotherapy. In addition to this, medical efficiency has increased and medical facilities have been expanded. Yet, instead of a decrease in the numbers of the ailing, the multitudes clamoring for relief has multiplied constantly. The reason is obvious. In every country, in every age, where man is released from privation and the pursuit of the necessities of life, he becomes aware of the person in the body. But this is not enough; he has turned his attention upon himself. By nature introspective, he begins to search his internal as well as his external environment for new and different sensations. In this search he discovers some of the normal activities of his body. His awareness of these functions does not necessarily carry with it full understanding of them and he frequently misinterprets them as abnormalities.

It is almost inevitable that he associates his internal findings with some of the facts, feelings, and ideas collected from his external world. Acceptable and unacceptable impressions are integrated with various specific sensory impulses, giving rise to agreeable and disagreeable sensations and reactions to them. He is likely to misinterpret such reactions as symptoms of disease. In reality they are disorders of perception or distorted interpretations of sense perceptions. They create in the individual fear and nervous tension. Naturally he fixes his attention on some innocent organ to express his abstract feelings and the organ "speaks."

Neuroses can be produced experimentally in animals where the avenue of escape from noxious stimuli is blocked. In primitive peoples they are induced by the incantations of witch doctors; in the more civilized peoples they are produced by suggestion and introspection. Neuroses are, therefore, the result of sensory conditioning processes and usually can take one of three courses:

1. The impressions may be disregarded and, so, have apparently no effect.
2. The impressions may be associated with agreeable sensation and prove beneficent.
3. The impressions may become associated with disagreeable sensations and lead to discomforts.

Few patients can be convinced that actually nothing is pathologically wrong with the functioning of their bodies. To them their suffering is real, and not imaginary as too many suppose.

In the treatment of a disagreeable neurosis, the sufferer must be provided with some avenue of escape. The patient must approve the diagnosis given and be convinced that the cause of the trouble can and will be removed. If this were not true, all "medical cults" would perish. In many cases the surgeon removes the cause by some operation; the internist by giving a pill or an injection; the psychiatrist by bringing to life some real or alleged childhood repression; the psychologist by hypnosis, producing disregard of pernicious stimuli or substitution of an agreeable association.

In all therapies, the attitude of the patient is a most important factor. This is particularly true in either ameliorating or intensifying the discomforts of pregnancy and the pain of parturition. It is equally true of pelvic pain, particularly essential dysmenorrhea.

It is apparent that this primitive protective physiological sensation becomes perverted to the disadvantage of the individual and the nation. It is important that the practicing physician recognize pain as a perception and not judge it solely by the reactions.

Summary

1. An attempt has been made to show that the ever-increasing afflictions of humanity are for the most part disorders of sensory perception and not symptoms of structural pathology.
2. The perception of pain is a psychobiological product of evolution and its intensity is the result of a sensory conditioning process.
3. Illustrative cases of psychosomatic disorders are presented.
4. Medicine of the future must be more educational than curative and attack environmental causes of disorders rather than structural changes of disease if it hopes to overtake the rate of increase of ailments.

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1033 GAYLEY AVENUE.

ETHINYL ESTRADIOL

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THE advantages of a potent oral estrogen are obvious. The need for such a preparation has, in recent years, prompted the appearance of numerous estrogens for oral use. Several such preparations were tested in a group of animal experiments. The material was fed to castrated female rats of standard size. The extent and duration of the estrogen effect was noted by means of daily vaginal smears. These studies will be reported in detail at a later date. However, of this group, ethinyl estradiol proved the most potent, and observations on its clinical use are the subject of this paper.

Ethinyl estradiol is a derivative of the natural follicular hormone alpha-estradiol, in which an ethinyl group replaces the hydrogen atom attached to the carbon atom in position 17 of the estradiol nucleus. Peculiarly, the introduction of the ethinyl group which has an acetylene linkage, ordinarily associated with chemical instability, brings to the molecule properties which markedly increase the efficacy when orally administered.

Ethinyl estradiol was used and its effects observed in the following conditions:

1. The menopause.
2. Amenorrhea, primary and secondary.
3. Suppression of postpartum lactation.
4. Labor.

Menopause.—Fifty-seven menopausal women were treated with ethinyl estradiol. This group included patients suffering from both surgical and natural menopause. A number of these patients had previously received other estrogenic preparations.

In all patients hormone assays were done, consisting of urine F.S.H. levels and urine estrone excretion, prior to the starting of therapy. In every instance in this group, F.S.H. was present and estrone was absent in the urine, prior to the starting of therapy. Vaginal smears and pH studies of vaginal secretions were done before, during, and after therapy.

The dose was one, two, or three tablets of 0.05 mg. of ethinyl estradiol daily, depending on the severity of the symptoms. After the symptoms were controlled, the dose was gradually reduced, and in many cases one tablet every seven to ten days was sufficient as a maintenance dose.

The following is a summary of our results in this group:

1. Forty-five patients, or 79 per cent, had complete relief from menopausal symptoms such as flushes, sweats, insomnia, nervousness, etc.
2. Ten patients, or 17 per cent, had moderate relief.
3. Two patients, or 4 per cent, had no relief.
4. All patients who obtained relief experienced a general feeling of well-being.

TABLE I

CASE	AGE	ONSET OF MENSES	AMENOR- RHEA	BASAL METABO- LISM RATE	URINARY HORMONE ASSAY	GLUCOSE TOLERANCE	VAGINAL pH	VAGINAL SMEAR
1	21	None	Primary	+4	Negative FSH Negative Estrin	Flat curve	5-8	Sub estrone
2	21	None	Primary	-3	Positive FSH Traces Estrin	Normal	5-8	Sub estrone
3	19	None	Primary	-10	Positive FSH Negative Estrin	Normal	5-7	Sub estrone
4	20	None	Primary	-7	Negative FSH Negative Estrin	Flat curve	5-8	Castrate-sub estrone
5	21	None	Primary	-4	Negative FSH Traces Estrin	Normal	5-8	Sub estrone
6	20	None	Primary	+1	Positive FSH Traces Estrin	Normal	5-8	Sub estrone
7	18	None	Primary	+3	Negative FSH Traces Estrin	Flat curve	5-8	Sub estrone
8	19	None	Primary	-5	Positive FSH Negative Estrin	Normal	4-7	Sub estrone
9	18	None	Primary	+9	Negative FSH Negative Estrin	Flat curve	5-8	Castrate-sub estrone

5. Vaginal smears became fully cornified in all patients in this group after taking ethinyl estradiol.

6. The pH studies did not run parallel to the vaginal smears and were of no value as an indication of estrogenization.

7. Eight patients, or 14 per cent, had nausea and vomiting, but in no instance was this severe enough to necessitate stopping of medication.

8. Vaginal bleeding was noted in nine patients, or 20 per cent, but was never severe. Bleeding always stopped with cessation of therapy. In a number

TABLE II. SECONDARY

CASE	AGE	ONSET OF MENSES	AMENOR- RHEA (MONTHS)	BASAL METAB- OLISM RATE	URINARY HORMONE ASSAY	GLUCOSE TOLERANCE	VAGINAL pH	VAGINAL SMEAR
1	19	16	4	- 6	Negative FSH 3 RU estrin	Normal	4-6	Sub estrone
2	24	16½	6	- 4	Negative FSH Traces estrin	Flat curve	4-5	Sub estrone
3	22	14	4	-11	Negative FSH Traces estrin	Flat curve	4-7	Sub estrone
4	35	14	4	+ 5	Negative FSH Negative estrin	Flat curve	4-8	Castrate-sub estrone
5	21	14	4	+ 2	Negative FSH Traces estrin	Normal	5-8	Sub estrone
6	26	15	5	- 7	Positive FSH Negative estrin	Normal	4-5	Sub estrone
7	22	15	4	- 1	Negative FSH 3 RU estrin	Normal	5-6	Sub estrone
8	20	14	4½	+ 6	Negative FSH Traces estrin	Normal	5-6	Sub estrone
9	20	15	5	- 1	Negative FSH Negative estrin	Flat curve	5-8	Castrate-sub estrone
10	19	15½	4	0	Negative FSH 5 RU estrin	Normal	5-8	Sub estrone

PRIMARY AMENORRHEA

SIZE OF UTERUS		DURATION OF TREATMENT	ENDOMETRIAL BIOPSY	SIDE EFFECTS	RESULTS
BEFORE TREATMENT (INCHES)	AFTER TREATMENT (INCHES)				
1½	3	1 year	Not done	Painful breasts	Good
1½	3½	14 months	Secretory after marriage	None	Good
1	3	16 months	Not done	None	Baby 15 months after marriage
1	3½	19 months	Not done	None	Good
2	3½	9 months	Not done	None	Good
1½	3	10 months	Not done	None	Good
1½	3½	10 months	Secretory after marriage	None	Good
1½	3½	8 months	Not done	Painful breasts	Good. Baby 11 months after marriage. Pregnant again
1	3	8 months	Not done	None	Good Good

of patients it was then possible to resume ethinyl-estradiol therapy with somewhat reduced doses, without a recurrence of bleeding.

9. Six patients with extremely severe symptoms responded more rapidly if parenteral estrogen therapy was first instituted in the form of alpha-estradiol-benzoate—1.3 mg. given twice weekly intramuscularly. These patients were given oral ethinyl-estradiol after some improvement was noted on this regime and improvement continued.

Amenorrhea.—It is our concept that in amenorrhea of sufficient duration, regardless of the etiologic factor, there are marked involutionary changes,

AMENORRHEA (MARRIED)

SIZE OF UTERUS		DURATION OF TREATMENT (MONTHS)	ENDOMETRIAL BIOPSY	SIDE EFFECTS	RESULTS
BEFORE TREATMENT (INCHES)	AFTER TREATMENT (INCHES)				
2	3½	4	Proliferation, secretory, 8 months later	Painful breasts	Fair
2	3½	4	Proliferation, secretory, 12 months later	Painful breasts	Fair
2	3½	3	Proliferation	None	Good
1½	3	6	Proliferation	Nausea	Good
2	3½	4	Proliferation, secretory, 10 months later	Painful breasts	Good
1½	3½	4	Proliferation	None	Good
2	3	5	Proliferation, secretory, 7 months later	None	Good
2	4	3	Proliferation, secretory, 11 months later	Painful breasts	Good
2	3½	5	Proliferation, secretory,	None	Good
2	4	7	8 months later Proliferation	None	Good

TABLE III. SECONDARY

CASE	AGE	ONSET OF MENSES	AMENOR- RHEA (MONTHS)	BASAL METAB- OLISM RATE	URINARY HORMONE ASSAY	GLUCOSE TOLERANCE	VAGINAL pH	VAGINAL SMEAR
1	18	15	5	-5	Positive FSH Traces estrin	Normal	4-6	Sub estrone
2	18	16	4	+3	Negative FSH Negative estrin	Flat curve	5-8	Sub estrone
3	22	16	8	+1	Positive FSH Negative estrin	Normal	6-8	Castrate-sub estrone
4	21	16½	6	-7	Negative FSH Negative estrin	Flat curve	4-6	Sub estrone
5	21	15	5	-4	Negative FSH Traces estrin	Flat curve	4-6	Sub estrone

manifested by a diminution in the size of the uterus and cervix, and, although the cause of the amenorrhea may be subsequently corrected, regular menstruation will not occur if the uterus and cervix remain hypoplastic. Our procedure with these patients, therefore, is to determine the cause of the amenorrhea, by means of a thorough investigation of the patient's endocrine status. The therapy is then directed at stimulating the growth of the uterus and cervix. This is accomplished by the administration of estrogens in sufficient dosage. By interrupting therapy at regular intervals, bleeding occurs. This is estrogen withdrawal bleeding and is psychologically highly desirable and encouraging to the patient. With this type of intermittent therapy, not only is the pituitary function not depressed, but in all probability it is stimulated.

The patient was considered amenorrheic if she had not bled for a period of at least four months. There were twenty-four patients in this group. Nine of these patients had primary amenorrhea—in this group menarche had not occurred. Their ages ranged from 16 to 21 years, and all were unmarried. Fifteen patients had secondary amenorrhea—these patients had previously menstruated. Their ages ranged from 16 to 35 years. Ten of this group were married, and five were single.

Ethinyl-estradiol—0.05 milligrams—was given daily for twenty days, followed by a 10-day interval during which medication was discontinued. In most instances bleeding occurred during this interval. The size of the uterus was noted periodically, and this therapy was continued until the uterus was normal in size. This took from three to six months, depending on the duration of amenorrhea and the degree of uterine hypoplasia. In resistant cases, the daily dose was doubled in order to produce uterine growth and bleeding.

Endometrial biopsies were done on all married patients¹⁰ with secondary amenorrhea, before, during, and after treatment.

The results are noted below:

1. All patients were made to bleed periodically.
2. Growth of the uterus and cervix was accomplished in all cases. The patients with primary amenorrhea required more prolonged treatment and larger doses to produce uterine growth and bleeding.
3. In those patients where endometrial biopsies were done, bleeding was noted from a proliferative endometrium during the therapy. Six patients, on whom follow-up biopsies were done seven to twelve months after the cessation of therapy, showed secretory endometrium four months after treatment was stopped. Two patients, although they were bleeding regularly, failed to show any secretory endometrium as late as two years after therapy was stopped.

AMENORRHEA (UNMARRIED)

SIZE OF UTERUS*		DURATION OF TREAT- MENT (MONTHS)	ENDOMETRIAL BIOPSY	SIDE EFFECTS	RESULTS
BEFORE TREAT- MENT (INCHES)	AFTER TREAT- MENT (MONTHS)				
2	3½	6	Not done	Painful breasts	Fair
2	3½	5	Not done	Painful breasts	Good
1½	3½	5	Not done	Vaginal bleeding and spotting	Good
1½	3	4	Not done	Nausea	Good
2	3½	4	Not done	Vaginal bleeding and spotting	Good

4. In those patients with primary amenorrhea and poor breast development, there was considerable development of the breasts and increase in the size of the nipples noted after the treatment. Eight patients complained of painful breasts which subsided after treatment was discontinued.

5. Two patients complained of mild nausea of a degree which did not necessitate cessation of therapy.

6. Two patients of the primary amenorrhea group were subsequently married, and have had one child each.

Tables I, II, and III give a detailed summary of the endocrine status, response to therapy, and biopsy follow-ups of the patients in this group.

Inhibition of Postpartum Lactation.—Ethinyl-estradiol was used to prevent breast engorgement and inhibit lactation in 145 nonnursing postpartum mothers. The effect of ethinyl estradiol on the lactating breast was studied in 26 nursing postpartum mothers.

1. Nonnursing mothers.

Thirty tablets of ethinyl estradiol, 0.05 mg., were given to the patients in this group over a period of nine days, starting within twenty-four hours of the time of delivery. The dose was administered as follows:

First three days—2 tablets three times daily.

Following three days—1 tablet three times daily.

Last three days—1 tablet daily.

Patients were observed during their stay in the hospital and were followed for a period of three to four weeks at home.

The absence of lactation and engorgement for a period of one month following delivery was classified as an excellent response. The result was noted as good, if slight engorgement or slight leaking without engorgement occurred for a day or two during the course of the therapy or after the patient left the hospital. It was considered fair if engorgement was more than slight or lasted more than two days and was associated with some leaking. The result was regarded as poor if there was moderate or full breast engorgement associated with leaking, and lasting several days.

No other form of medication was given, and breast support was not used except in those patients classified as poor.

The results are summarized as follows:

Excellent	85 patients (58 per cent)
Good	23 patients (16 per cent)
Fair	22 patients (16 per cent)
Poor	15 patients (10 per cent)

Five of the total number of patients in this group reported vaginal staining during the first three weeks following their discharge from the hospital.

It is apparent then that three out of four patients can expect to have satisfactory results in suppression of lactation and engorgement by using ethinyl estradiol in the manner described.

2. Nursing mothers.

The same dosage schedule was used in twenty-six nursing mothers with the following results:

There was no suppression of lactation or breast engorgement in six patients.

There was partial suppression of lactation and breast engorgement in seven patients.

Complete suppression of lactation and breast engorgement was obtained in spite of regular nursing of infants in six patients.

Labor.—Ethinyl-estradiol was used to influence labor in forty-nine patients. This group was divided into patients in whom it was desired to induce labor (fifteen patients), and patients who were experiencing a slow nonprogressive type of labor (thirty-four patients).

The dose used was 6 tablets 0.05 mg. ethinyl estradiol every two hours up to 15 doses. There were no side effects as the result of this treatment.

The results were as follows:

1. In the group of 15 patients in which ethinyl estradiol was used to induce labor, the treatment was successful in ten cases, and without effect in five. In the ten successful cases, five patients were delivered within twelve hours after the start of the treatment; two patients were delivered twenty-six hours after the therapy was started; two were delivered in twenty-six hours; and one was delivered in thirty hours.

2. In the group of thirty-four patients in which this regime was used to hasten labor, the therapy was apparently successful in thirty cases and without results in four patients. In the successful group, twenty-six patients delivered within twelve hours, and four delivered within twenty hours.

Summary

1. Ethinyl-estradiol is an extremely potent oral estrogen.
2. Moderate or complete relief from menopausal symptoms was obtained in 96 per cent of patients. Toxic symptoms were negligible.
3. Growth and development of the hypoplastic uterus as well as bleeding was accomplished in 100 per cent of patients with primary and secondary amenorrhea.
4. Inhibition of lactation was effected in 75 per cent of nonnursing mothers without untoward results, and there was no excessive postpartum bleeding.
5. The use of ethinyl estradiol in the induction and hastening of labor is presented.

We are indebted to Dr. Erwin Schwenk and Dr. Edward Henderson of the Schering Corporation for their cooperation and generous supply of material.

A STUDY OF CERVICAL CULTURES TAKEN IN CASES OF ACUTE GONORRHEA WITH SPECIAL REFERENCE TO THE PHASES OF THE MENSTRUAL CYCLE

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THE question of why so many negative cultures have been obtained from patients having clinical pictures of acute gonorrhea has long been a puzzling one to bacteriologists. The favorite explanation has been the lack of a sufficiently nutritive medium upon which to grow the organism. The use of pancreatic digest agar containing 5 to 10 per cent human chocolate blood, as described by Koch,¹ should have overcome the cultural difficulties; nevertheless an undesirable number of negative cultures are still being obtained.

In 1940, Lamar, Shettles, and Delfs² showed that there was a relative change in the alkalinity and acidity of the cervical mucus during the menstrual cycle, and that there was a positive correlation with the penetrability of spermatozoa between these changes and other factors.

It seemed possible that the cyclic changes in the cervical mucus might also have an effect upon the viability of the gonococcus in vivo.

Material

As a preliminary investigation, 50 histories of patients whose cervixes were cultured because of suspected gonorrheal infection were studied with regard to the menstrual cycles. The date of culturing the cervical secretion was noted in relation to the date of the menstrual cycle. The results showed that in the first half of the cycle when the pH of the cervical mucus is greater than 6.8, 66.0 per cent of the cultures were positive, and in the last half of the cycle when the pH is less than 6.6, only 10 per cent were positive.

Since this preliminary study suggested that there might be a correlation between the cervical mucus pH and the ability to culture the gonococcus, further studies were immediately undertaken.

The cervixes of 50 patients suspected of having acute gonorrhea and having normal menstrual cycles were cultured and smeared, and the cervical mucus pH determined. The method used was as follows: mucus was aspirated from the cervical canal by means of a sterile, curved, capillary glass pipette fitted with a rubber bulb. The pH of the sample was immediately tested by using a series of buffer solutions and indicators as described by Brown.³

Results

The normal menstrual cycle, consisting of approximately twenty-eight days, was divided into phases based upon the action of the two ovarian hormones (Fig. 1).

1. Preovulatory or proliferative phase, sixth through eleventh day. At this time the cellular changes are under the influence of the estrogenic hor-

mones. Very little or no glycogen is being formed or stored in the epithelial cells of the endometrium during this phase which is largely one of growth.

Fifteen patients having evidence of acute gonorrhea were examined during this phase. The pH range of their cervical mucus was 7.6 to 6.8. Eleven had positive cultures and four had negative cultures.

2. Ovulation, twelfth through sixteenth day. This division of days is based upon the findings of Allen, Pratt and Newell,⁴ who washed out tubes exposed at operation and were not able to recover ova prior to the twelfth day or later than the sixteenth day. During this time estrogenic activity is at its peak and the columnar cells of the cervical glands yield their greatest amount of mucus.

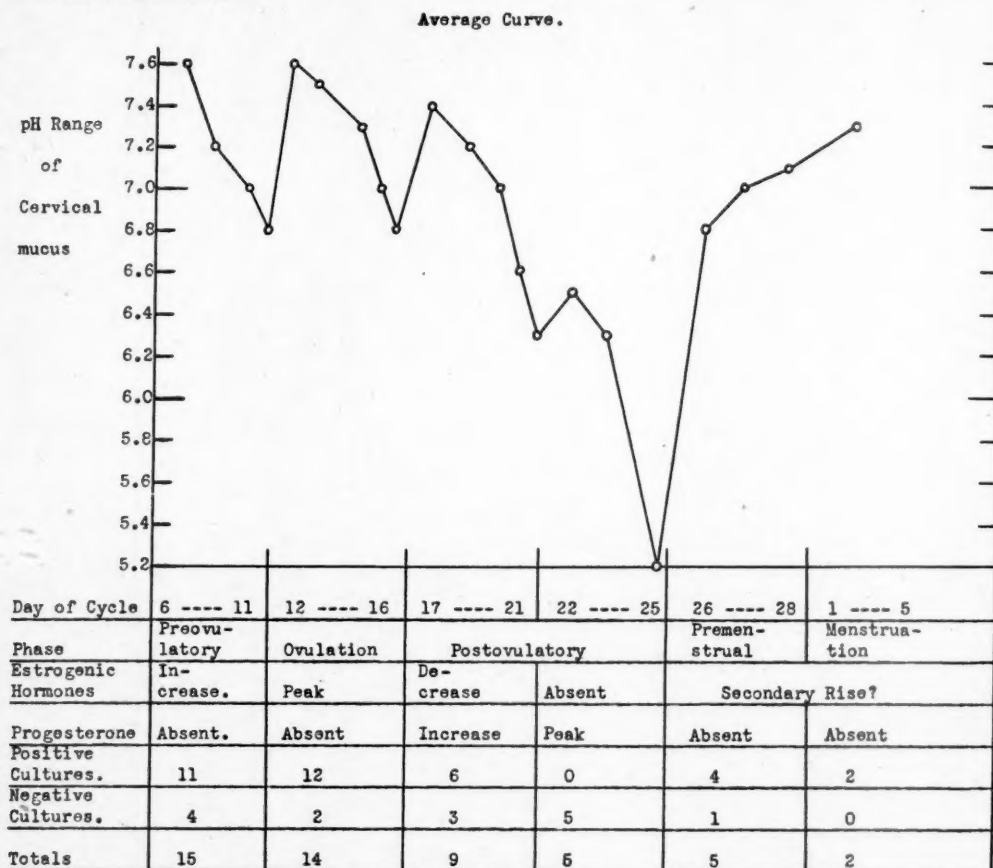


Fig. 1.—Results of cervical cultures on fifty dispensary patients suspected of having acute gonorrhea, with regard to the pH of the cervical mucus and phase of the menstrual cycle.

Fourteen patients suspected of having acute gonorrhea and whose pH range was 7.6-6.8 were examined. Twelve had positive cultures, and two had negative cultures.

3. Postovulatory or secretory phase, seventeenth through twenty-fifth day. There is a gradual decrease in estrogens, and the endometrium and cervical glands come under the influence of progesterone. During this time glycogen is being formed in the cells of the endometrium and is also being rapidly excreted. Pommerenke⁵ demonstrated that the largest amount of fermentable carbohydrate in the cervical glands occurs at this time.

A total of 14 patients with clinical signs of acute gonorrhea were examined during this phase. Six of these were examined on the seventeenth day of their cycles and all yielded positive cultures. The pH range of their cervical mucus was 7.4 to 6.8. Eight patients who were examined on the eighteenth through the twenty-fifth day and whose pH range was 6.6 to 5.2 yielded only negative cultures. Three of these patients had had previous positive cultures taken during menstruation and ovulation, and no treatment had been administered prior to the taking of the second cultures.

4. Premenstrual phase, twenty-sixth through twenty-eighth day. This is characterized by a withdrawal of progesterone and, according to some investigators, by a secondary rise in the estrogens. Chemically it is marked by glycogen exhaustion in the endometrium. The pH range of the cervical mucus of five patients tested during this phase was 7.1 to 6.8. Four had positive cultures and one had a negative culture.

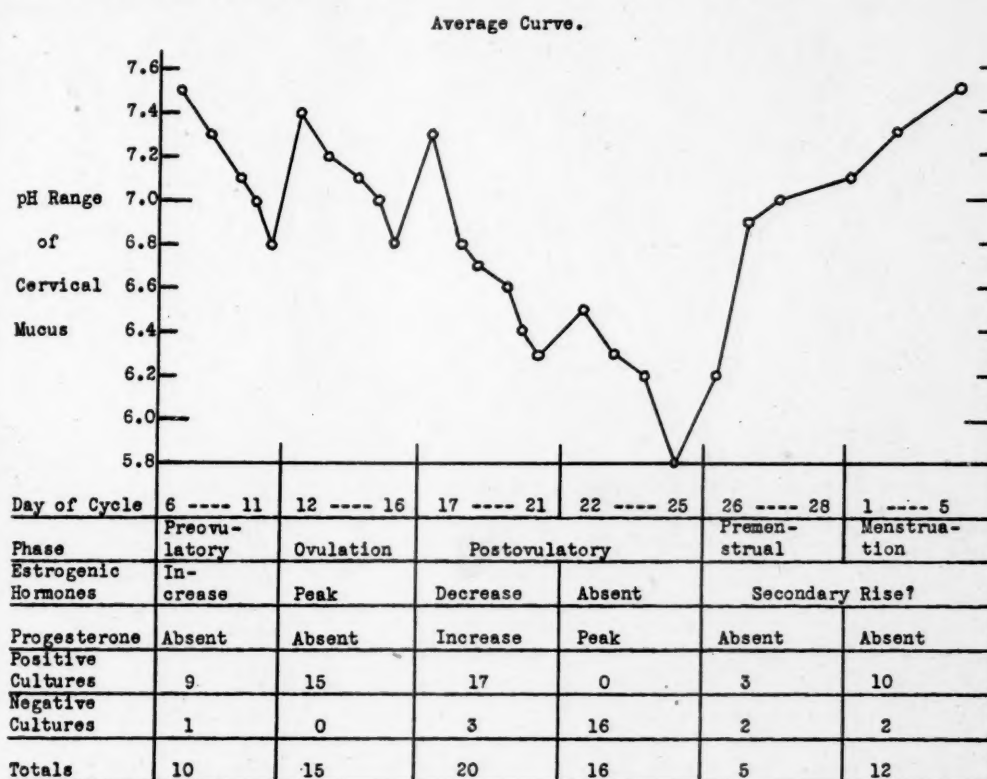


Fig. 2.—Seventy-eight cervical cultures from four hospitalized patients having bacteriologically proven acute gonorrhea, with regard to the pH of the cervical mucus and the phase of the menstrual cycle.

5. Menstruation, first through fifth day. This is characterized by sloughing off of the endometrium. At this time all hormone activity is at its lowest level and the pH of the cervical mucus is above 7.0.

Two patients examined during this phase had positive cultures.

Of a total of 50 patients studied 70 per cent, or 35 cases, had positive cultures, whereas 26 per cent, or 13 cases, had positive smears. All of the positive cultures were obtained when the pH of the cervical mucus was 6.8 and above. Fifty-three per cent of the negative cultures were obtained during the postovulatory or luteal phase when the pH of the cervical mucus was 6.6 to 5.2.

Of the 35 positive cultures, 30 were isolated in pure culture and all fermented dextrose only.

These results led to further investigations to determine whether patients having positive cultures during the estrogenic phases of their cycles, and negative cultures during the phase of progesterone activity, would again yield positive cultures during the estrogenic phases of their subsequent cycles (Fig. 2).

Six untreated patients, having bacteriologically proved acute cervical gonorrhea and normal menstrual cycles, were hospitalized for a period of time sufficient to carry them through the duration of their current cycles and into part of their subsequent cycles. No treatment other than bed rest and sedation, if necessary, was administered. Smear examinations, cultures and pH determinations were made daily on the cervical mucus. Four patients yielded normal pH curves, and two patients yielded atypical curves.

Results of the four patients having normal pH curves:

1. During the preovulatory phase in a total of ten cultures nine were positive and one was negative.

2. Fifteen cultures were taken during ovulation all of which were positive.

3. A total of 36 cultures were taken during the postovulatory phase. Twelve of these were taken during the early part of the phase when the pH of the cervical mucus was 7.3 to 6.8; all were positive. Five cultures from the same patient were positive when the pH range was 6.4 to 6.2, but these cultures were characterized by a tremendous decrease in the number of organisms present, as evidenced by colony counts, in comparison with the number of organisms present in mucus at pH 6.8 and above. Sixteen cultures, all of which were negative, were taken during the latter part of the luteal phase (twenty-second through twenty-fifth day) when the pH of the cervical mucus was 6.4 to 5.8.

4. Premenstrual phase—two negative cultures were obtained when the pH was 6.2, and three positive cultures were obtained when the pH was 6.8.

5. Menstruation—ten positive cultures and two negative cultures were obtained during this time.

In a total of 78 cervical cultures 69.2 per cent, or 54 cultures, were positive, whereas in a total of 78 cervical smears 50.2 per cent, or 41 smears, were positive. Of 54 positive cultures, 90.7 per cent, or 49, were obtained during the estrogenic phases of the cycle and first two days of the luteal phase, when the pH of the cervical mucus was 6.8 and above.

In a total of 24 negative cultures, 70.8 per cent, or 17, were obtained during the luteal phase when the pH was 6.5 to 5.8.

All four patients had five to seven consecutive negative cultures during the luteal phase of the cycle, which were followed by positive cultures in either the premenstrual phase or during menstruation.

The two patients having atypical pH curves yielded the following results: One patient had a total of twenty cervical cultures during which time the pH range was 7.4 to 6.7. All cultures were positive. This may have been a case of anovulatory menstruation since the patient had been married for two years without any pregnancies. The other patient had a total of 27 cultures. Twenty-three consecutive cultures were negative during which time prior to the onset of menstruation, with the exception of one day, the pH was 6.6 to 5.2. On the eighth and ninth days of the subsequent cycle the cultures were positive.

Summary

In a total of 128 cervical cultures, 69.4 per cent, or 89 cultures, were positive; of these, 94.2 per cent, or 84 cultures, were positive during the estrogenic phases and the early part of the luteal phase of the cycle when the pH of the

cervical mucus was 6.8 and above. Thirty-nine cultures, or 30.6 per cent, were negative. Twenty-six of these, or 66.4 per cent, were obtained during the latter part of the luteal phase when the pH range was 6.4 to 5.2.

Since smears were positive in only 54 cases, or 42.1 per cent, of the total, the invalidity of negative smears from female patients should be re-emphasized.

An investigation of the effect of low pH upon the viability of the gonococcus was tested in vitro. Pancreatic digest broth adjusted to various pH values was used as the test medium. Six freshly isolated strains reacted in the same manner. When grown in broth at pH 6.8, growth was reduced approximately 50 per cent, as evidenced by colony counts, in comparison with growth in broth at pH 7.2. At pH 6.4 and 6.0 the organism remained viable for four and two hours, respectively.

Pure crystalline progesterone incorporated in pancreatic digest broth giving a final concentration of 1 to 20,000 completely inhibited the growth of the gonococcus in two hours, regardless of the pH of the medium.

Pure crystalline alpha estradiol in a concentration of 1 to 5,000 had no visible effect upon the growth of the organism. These results agree with the studies of Faulkner,⁶ who showed that alpha estradiol in a concentration of 1 to 7,500 had no inhibitory effect upon the growth of *Neisseria catarrhalis* in vitro.

To my knowledge to date, the concentration of progesterone in the cervical mucus has not been determined, due to the lack of sufficiently sensitive tests. The activity of the corpus luteum is not measured by the activity of its biologically active hormone progesterone, but by the excretion in the urine of its biologically inactive metabolite pregnandiol. According to Venning and Browne,⁷ pregnandiol appears in the urine twenty-four to forty-eight hours after ovulation and disappears when the corpus luteum begins to retrogress two to three days before the onset of menstruation.

Conclusions

1. There is a definite correlation between the isolation of the gonococcus from cervical cultures and the phase of the menstrual cycle in which the cultures are taken.

2. Negative cultures are associated with the latter part of the luteal phase of the cycle when the cervical mucus is most acid and progesterone activity is at its height.

3. Positive cultures are associated with the estrogenic phases of the cycle when the pH of the cervical mucus is 6.8 and above.

4. Apparently several consecutive negative cultures without the knowledge of the pH of the cervical mucus at the time of culturing, does not mean absence of infection. Acid mucus is associated with negative cultures when there still may be active foci of infection possibly deep in the cervical glands.

5. Whenever possible the pH of the cervical mucus should be tested at the time of culturing. When this is not possible the date of the onset of the patient's last menstrual period should be noted when the cultures are taken.

The author wishes to thank Dr. J. Howard Brown for his constructive criticism during the course of this investigation, and to acknowledge the valuable assistance of Dr. Richard W. TeLinde, Dr. Georgianna Seegar-Jones, Miss Elena Williams, and other members of the Department of Gynecology in making the clinical material available.

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COLD PRESSOR TEST AND KIDNEY FUNCTION*

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THE vascular response to the cold pressor test consists of a rise† or, rarely, a fall in systolic and/or diastolic blood pressure.^{1, 2} In addition, vasospasm,^{3, 4} a proteinuria, and a decreased endogenous creatinine clearance rate⁵ have been detected during and following the test. The last two findings, associated with a rise in blood pressure, have been interpreted as being due to the effect of vasospasm within the kidney.⁵ The present study reports the effect of a prolonged (six and one-half minute) cold pressor test on blood pressure and renal function.

Materials and Method

A total of 14 pregnant and nonpregnant women were selected for study. Of these, all but one of the former had evidence of pregnancy toxemia, and all of the latter had a positive history of hypertension.

From 6 A.M. until completion of test, the patient drank 200 c.c. of water every one-half hour. An inlying catheter was used to obtain urine specimens, and air was injected into the bladder at the conclusion of each clearance period to insure complete emptying.

Three consecutive half-hour specimens, relatively equal in volume, were obtained. The first two were discarded and the third was retained as representative of the control period. The patient's hand was then immersed in ice water for six and one-half minutes, the blood pressure being obtained from the

TABLE I. COLD PRESSOR TEST AND KIDNEY FUNCTION EFFECT ON BLOOD PRESSURE AND URINE PROTEIN EXCRETION

PATIENT	MAXIMUM RISE SYSTOLIC BLOOD PRESSURE MM. HG	MAXIMUM RISE DIASTOLIC BLOOD PRESSURE MM. HG	MG. PROTEIN PER MINUTE URINE CLEARANCE PERIODS			
			1	2	3	4
239868	40	32	0	0.13	0.13	0
376640	50	30	0	0.77	0.18	0.46
378732	30	30	0	0	0	0
375166	40	22	0	0	0	0
385336	70	38	-	-	-	-
245483	8	0	0	0.13	0.08	0
376050*	10	16	0	0	0	0
376091*	28	20	1.16	1.69	1.18	1.82
246828*	26	24	0.16	0.17	0.16	-
240186*	20	20	0.13	0.22	0.25	0.19

*Patients exhibiting no decrease in urine volume as a result of ice immersion (broken lines in Figures 1, 2, and 3).

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†Twenty-two mm. Hg systolic is considered the upper limit for a normal increase in non-pregnant individuals (1); 29 mm. Hg during pregnancy (2).

opposite arm. Two consecutive fifteen-minute urine specimens and a final half-hour specimen were collected. Blood was drawn at the approximate midpoint of the test.

Blood and urine urea analyses were made as described by Koch⁶ and Van Slyke and Cope,⁷ urine chlorides were measured according to the Volhard-Harvey procedure,⁸ and urine proteins were estimated by the method described by Shevky and Stafford.⁹

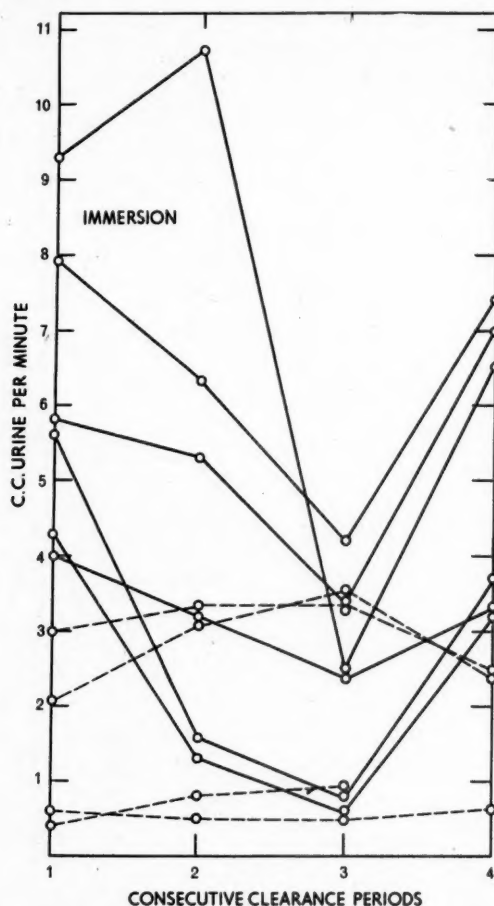


Fig. 1.—Cold pressor test and kidney function. Urine excretion per minute.

Results

In four patients who served as controls, the rate of urine excretion, urea clearance rate, U/B, chloride and protein excretion remained relatively constant during four consecutive half-hour periods.

In six of ten patients subjected to a six and one-half-minute ice immersion, a significant decrease occurred in the amount of urine collected. The decrease was reflected in a sharp decline in urea clearance rate and chloride excretion/minute and in an increased U/B ratio. In four of this group a proteinuria followed immersion. The blood pressure rose appreciably in five patients.—The maximum systolic rise varied between 33 to 70 mm. Hg, diastolic 22 to 28 mm. Hg. In one case there was no significant change in blood pressure.

In the four remaining patients no changes were observed in urine collected following exposure to ice water. This group was characterized by an initial low urea clearance rate, and, in two instances, by a relatively low urinary output. The blood pressure, however, increased 20 to 28 mm. Hg systolic and 16 to 24 mm. Hg diastolic (Figs. 1, 2, and 3, and Table I).

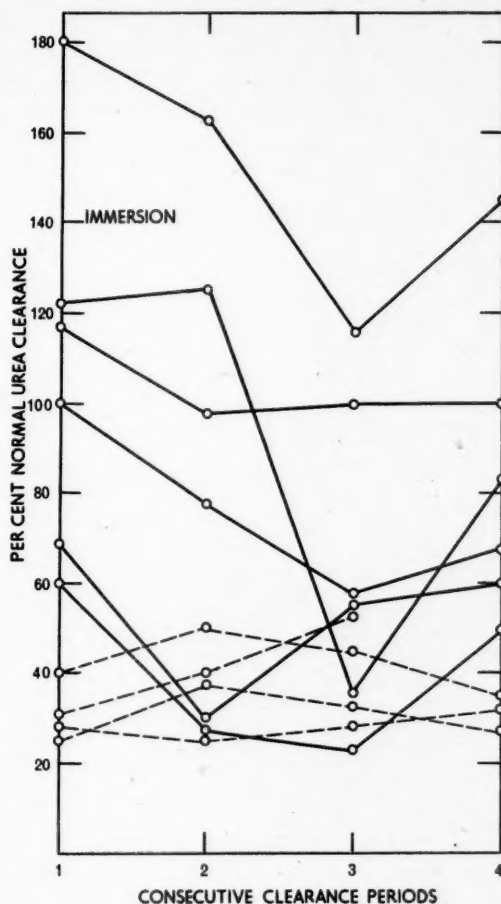


Fig. 2.—Cold pressor test and kidney function. Urea clearance; per cent normal.

Comment

Changes in the volume of urine excreted depend upon either the filtration rate or rate of tubular reabsorption, or both. Among the factors influencing the former are: variations in filtration surface (number of functioning glomeruli), and changes in intracapsular pressure, renal blood flow or plasma protein content; tubular reabsorption depends upon the rate of urine flow through tubules) as well as upon the antidiuretic effect of the posterior pituitary gland. Either mechanism would explain a suppressed excretion following ice immersion.

Wolfe¹⁰ obtained variable figures for renal blood flow and glomerular filtration (using diodrast and inulin) following cold exposure, but observed a sharp depression of both functions after other painful stimuli. Verney,¹¹ however, using a thermostromuhr on the denervated dog kidney, recorded only a transient fall in renal blood flow following an electrical stimulus to subcutaneous

tissues. He attributed the antidiuresis after such a stimulus to a posterior pituitary effect.

The administration of solution of posterior pituitary to pregnant patients results in an antidiuresis and a relative increase in chloride excretion.¹² Whether the suppression and the decline (per minute) in urine chlorides following ice immersion involves pituitary action requires further investigation. A higher maximal increase in systolic and diastolic blood pressure was noted in cases exhibiting urine suppression, and a proteinuria followed immersion in three of five such patients (Table I). These facts suggest an altered filtration rate, possibly the result of vasospasm, as an underlying mechanism.

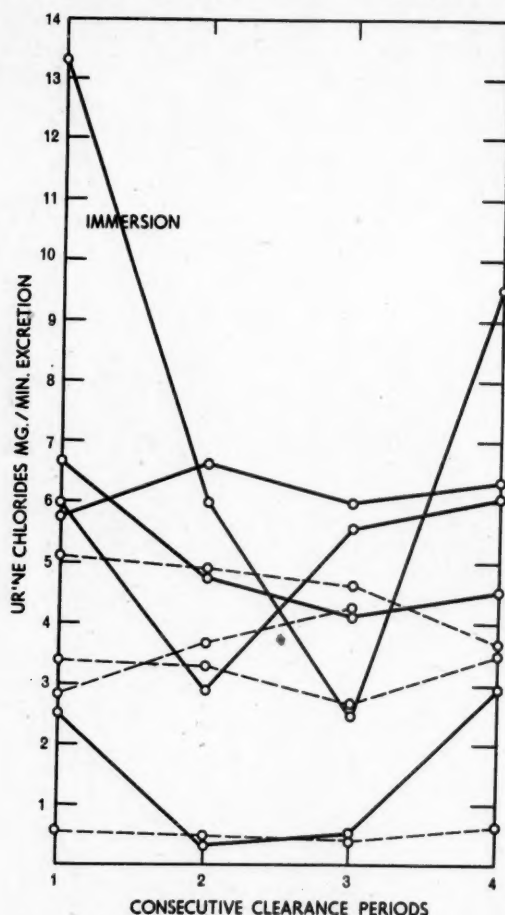


Fig. 3.—Cold pressor test and kidney function. Chloride excretion per minute.

Summary

Under constant conditions of water intake and urine excretion the immersion of one hand to the wrist in ice water may reduce the urine collected per minute, the urea clearance rate, and the renal excretion of chlorides per minute. This phenomenon may be associated with an increase in urine protein excretion. Those patients not responding to the ice water stimulus tended to have a lower urine volume or urea clearance rate initially, and exhibited a less pronounced increase in systolic and diastolic blood pressure.

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A NEW RULE FOR CORRELATING THE AGE OF HUMAN FETUSES WITH SIZE IN INCHES*

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IN AN attempt to simplify more complicated formulas (*e.g.*, Henri and Bastien, 1904; Scammon, 1921) of use in computing the age and size of human embryos, Scammon and Calkins (1923) have published empirical formulas which, though far simpler, cannot be kept in mind with any ease and cannot be carried out as a mental calculation. These particular formulas apply to fetuses between 3 and 10 months old and are in terms of crown-heel (standing height) values only. Noback (1922) has shown how to derive either crown-heel length from crown-rump length (sitting height) during the fetal period, or the reverse.

Familiar working rules are those of Haase (1875), which state that for the first five fetal months the total length in centimeters (crown-heel or standing height) equals the square of the month, whereas in the last five fetal months it equals the number of the month multiplied by five. The results gained from these calculations fit the actual measurements rather closely. In order to obtain greater flexibility and range, the present writer (1925) proposed equally simple formulas that could be employed to calculate age from metric length or metric length from age; the measurement of length used could be expressed either in standing- or sitting-height values. These latter formulas have enjoyed a degree of popularity and have been incorporated in textbooks both in this country and in Europe.

From the standpoint of a student or practitioner living in an English-speaking country, there is some advantage in a rule that is based on inches, rather than on centimeters as hitherto has been the case. The plain fact remains that few individuals in this country, at least, think or estimate well in metric values. With this in mind, the attempt was made to devise a simple rule that could be easily remembered and readily applied to estimates or measures of fetal length in inches.

The chief difficulty in producing any kind of simple formula is the fact that the growth rate of a fetus is not uniform throughout the period of gestation. In the first five months it is decreasing rapidly, whereas in the last five months it is nearly constant. This means that actually there must be two rules, if the two sets of conditions are to be met without resorting to an unwieldy mathematical formula that combines both into a single expression. The last half of gestation presented no difficulty since the constant 5, used by Haase for centimeter values, converts directly into 2 when using inches (1 in. = 2.54 cm., or 2 in. = 5.08 cm.). On the other hand, the rule for the first half of gestation was obtained only after numerous attempts on a trial-and-error basis had been made. The new rules for calculating the greatest length in inches of an embryo or fetus at any lunar month are as follows:

For the first five lunar months, add the numbers of the preceding months.

Examples: At 1 month = 0 inch
At 3 months, $1 + 2 = 3$ inches
At 5 months, $1 + 2 + 3 + 4 = 10$ inches

For the last five lunar months, multiply the number of the month by two.

Examples: At 6 months, $6 \times 2 = 12$ inches
At 10 months, $10 \times 2 = 20$ inches

*Contribution No. 476 from the Anatomical Laboratory, Northwestern University Medical School.

It is believed that these rules have much to commend them in simplicity, convenience, and accuracy. The computations obtained represent the total length, including the straightened legs when present; actually the legs are present and increase the greatest length in all months except the first. In practice it makes no difference which rule is used at five months, since $1 + 2 + 3 + 4 = 10$ and $5 \times 2 = 10$. When formulating the rules it seemed that memory might be aided better if the period of intrauterine development were broken into exact halves consisting of months 1 to 5 and 6 to 10.

The same rules can be used in reverse for the purpose of calculating age from size. The age of any fetus more than 10 inches long is one-half its total length in inches. The age of fetuses less than 10 inches long can be found by matching fetal length to the nearest sum obtained by the addition of month numbers, as already explained. It is clear that the age must be one month more than the highest month number used in the successful match. All this is much simpler than it sounds. For example, a 6-inch fetus matches $1 + 2 + 3$ months, and hence must be four months old.

The closeness of fit of the results obtained by these empirical formulas to the actual measures of crown-heel length can be seen in the appended tabulation. For purposes of comparison, the percentages of error in the calculations obtained by using Haase's rules have been added as a last column of the table. No entry has been made for the percentage error at one month when using the new rule; this is because it is meaningless to record the error as infinite when it is only 0.2 inch from being correct.

TABLE I.

AGE IN LUNAR MONTHS	CROWN-HEEL LENGTH IN INCHES	CALCULATED CROWN-HEEL LENGTH	PERCENTAGE ERROR OF CALCULATION	PERCENTAGE ERROR, USING HAASE'S RULE
1	0.2	0.0		+100
2	1.2	1.0	-17	+ 33
3	2.9	3.0	+ 3	+ 23
4	6.2	6.0	+ 3	+ 2
5	9.4	10.0	+ 6	+ 5
6	11.7	12.0	+ 3	+ 1
7	14.0	14.0	0	- 1
8	16.1	16.0	- 1	- 2
9	18.0	18.0	0	- 2
10	19.8	20.0	+ 1	0

Summary

Empirical formulas, expressed as two easily remembered rules, have been presented by which fetal age and fetal size in inches can be readily correlated through a simple mental calculation. The conversion can proceed from age to size or from size to age.

Any error resulting from the use of these rules is less than the error that would ordinarily occur in measuring a specimen.

The fit of these formulas is somewhat better than that obtained from the use of Haase's rules, and the reliability of the latter is very good indeed.

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ADVANCED ABDOMINAL PREGNANCY

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ADVANCED abdominal pregnancy is so rare that only a few clinicians encounter an occasional case. For this reason it is interesting that within a period of two months the three cases reported here should have been seen in a single hospital.

In treating the cases, two practical questions arose to which answers were not easily found in the literature. These were (1) the length of time required for the placenta to become avascular when left in the abdomen after the death of the patient or removal of the fetus, and (2) the time necessary for absorption of the retained placenta.

In the individual case the time at which the placenta becomes avascular can be determined by a pregnancy test. Eisman and Ziegler had a case in which the child was living at operation and the placenta was left intact. Eight days later the Aschheim-Zondek test was negative. MacGregor's patient had a negative test ten days after removal of the fetus. On the other hand, in the first case reported here, the Friedman was positive on the fifty-third postoperative day and became negative on the fifty-eighth. A patient of Hart had a positive test one hundred days after fetal movements were last felt. Lull had a patient on whom the Friedman was positive on the forty-fifth postoperative day. At laparotomy fifty-six days after the original operation, the placenta was necrotic. He suggests that if the patient is first seen after death of the fetus three to four weeks be allowed to elapse before operation, if her condition warrants. This gives a reasonable time in which separation and necrosis of the placenta may proceed, and makes the possibility of safe removal of the placenta more likely. The patient should be watched during the time for evidence of abdominal hemorrhage or infection.

The second question which arose was the length of time required for absorption when the placenta is left in the abdomen. When not removed the placenta may absorb, it may liquefy, or it may suppurate. Suppuration requires surgical drainage. However, drainage of the mass, as would be expected, hastens its disappearance. When there is no suppuration, there is usually no pain nor discomfort, but resolution of the placental mass takes months or even years.

In the second of our cases liquefaction without suppuration took place. Eight months after operation the mass was the size of a six months' uterine pregnancy. MacGregor reports a similar case in which at the end of sixteen months the sac was the size of an orange. A patient seen by Mason had a residual mass two inches long after five months. Studdiford has seen a case in which at the end of thirteen months a pelvic mass was still felt, while Jewett's patient had a small residuum two and one-half years after operation. In none of these patients was there any abdominal discomfort.

CASE 1.—The patient was a Negro woman 28 years of age, who had had no previous pregnancy. Her last menstrual period was Nov. 25, 1945. On January 20 she developed lower abdominal pain. The pain was not knifelike, and she did not faint, but after two days of the pain she developed moderate vaginal bleeding which persisted for eight days. There was no further pain nor bleeding. Fetal movements were felt about April 20.

The patient was first seen on May 20. She had no complaint. The abdomen had the appearance of an eight months' pregnancy, but enlargement on the right was more prominent than on the left. Small parts could not be palpated. The fetal heart tones were heard in the left lower quadrant.

On vaginal examination the cervix was soft. The fundus could not be outlined, and pressure on the abdominal mass from above did not cause movement of the cervix. On rectal examination a cystic mass could be felt extending into the cul-de-sac. Small parts were felt in this mass. When an extremity in the cul-de-sac was caught by the examining fingers it moved vigorously. X-ray showed a seven months' fetus in transverse position. No placenta shadow could be seen. A diagnosis of abdominal pregnancy was made, and immediate operation advised.

On opening the abdomen on May 23, a bluish glistening mass was found filling the lower abdomen and extending three fingerbreadths above the umbilicus. The mass was adherent to the small intestines above, and to the posterior surface of the uterus below. As there were no adhesions to the anterior surface of the sac, and as the surface here was glistening, this area was thought to be made up of membranes only, and a longitudinal incision was made through it. The entire incision went directly through the underlying placenta which was about one-half inch in thickness.

Due to the necessity to complete the operation as soon as possible because of bleeding, no further investigation of the relationship of the pelvic organs to the sac was made. After the operation was completed, it was realized that the fact that the sac had a complete peritoneal envelope meant that rupture of the original tubal pregnancy had taken place into the broad ligament on the left and that the fetus and fetal products were contained between the leaves of the ligament.

At operation on opening the sac there was a gush of amniotic fluid, and a live seven months' female infant was delivered. The child died two hours later. Autopsy revealed no anomalies.

Bleeding from the cut edges of the placenta was profuse but was controlled by ring forceps, which were carefully replaced by sutures. Manipulation, however, had started bleeding from the placenta deep in the sac. Two two-yard gauze packs were used to check the bleeding. The abdomen was closed, space being left only for the exit of the gauze drains.

The patient left the table with a blood pressure of 80/0. She had received 500 c.c. of blood on the operating table, and was given an additional 1,000 c.c. during the next thirty-six hours. On the second postoperative day the drains were gently loosened, and about one foot of each removed. This procedure was repeated daily until all of the pack had been removed by the seventh day. Blood was kept in readiness for immediate transfusion in the event of a post-operative hemorrhage, but at no time was there any fresh bleeding. The patient, however, developed a rather free dark brown discharge from the wound. She left the hospital on the sixteenth day. At that time her hemoglobin was 65 per cent and she had no elevation of temperature.

Three weeks after delivery a little milk appeared in the breasts. A week later she passed a large sheet of decidual tissue. Seven weeks after operation the patient developed a moderate grade fever and abdominal pain, and on examination showed a mass the size of a grapefruit near the umbilicus. She was readmitted to the hospital. Chemotherapy largely controlled the fever, but the pain persisted and the abdominal mass increased in size. A Friedman test on August 8 was positive. On August 13, fifty-eight days after removal of the infant, it became negative. The brown discharge from the abdominal wound had persisted and, in spite of iron and liver by mouth, an occasional transfusion was necessary to keep the patient's hemoglobin to a level of 60 per cent.

On August 24 the necrotic placenta was removed. The opening in the sac had sealed over, and the persistent discharge was coming from the abdomen and not the sac. On incising the sac about 30 c.c. of thick pus poured out. Five grams of sulfanilamide powder were sprinkled into the sac and three Penrose drains inserted, which were removed on the third day. On the sixth day the patient complained of rectal pain, her temperature was 100° F., and a cystic tender mass the size of a golf ball was felt in the cul-de-sac on vaginal examination. A posterior colpotomy was done under local anesthesia, and about 40 c.c. of pus were released.

The patient's recovery following this was uneventful. There was a diminishing purulent discharge from the abdominal incision for eight weeks following the operation. When seen four months after operation, the patient looked well and had no complaint. On pelvic examination, a slightly tender mass the size of a ping-pong ball could be felt in the right fornix. No other pelvic abnormality was made out.

CASE 2.—The patient was a 36-year-old woman, gravida vii para iii, who entered the hospital on June 27, 1946. Her last menstrual period was about August 20, ten months before admission. On October 2, when rising from her chair, she developed a sharp pain in the right lower quadrant and had to be carried to her bed. For the next three days she had a spotting of bright red blood. There was no further vaginal bleeding until the day before admission when there was again a small amount of bright red blood.

The patient was not well from the time of her first attack of pain until her admission to the hospital. She had frequent attacks of vomiting, faintness, and abdominal pain. She was seen by several different doctors who thought that she was having threatened abortion or had a pelvic infection along with a uterine pregnancy.

The first fetal movements were felt in December. As soon as movements became vigorous (about January 10) they were accompanied by so much pain that the patient could not sleep. The movement was always on the right side of the abdomen. Fetal movements were last felt on May 22.

On June 26, the patient developed pain in the right lower quadrant and a little bright vaginal bleeding. She was admitted to the hospital in good general condition on the following day. Red blood cell count was 3,440,000; hemoglobin, 71 per cent; Rh negative. The abdomen was enlarged to the size of a ten months' pregnancy, but felt very nodular. Fetal small parts were easily made out. No fetal heart tones were heard. X-ray showed the fetus in transverse position. A diagnosis of abdominal pregnancy with a dead fetus was made, and operation was decided upon.

Operation was performed on June 30, 5½ weeks from the day fetal movements were last felt.

On opening the peritoneal cavity a small amount of dark prune-juice colored fluid appeared. A macerated fetus about the size of a seven months' gestation was found lying in its membranes. The sac was opened through the membranous area, and the placenta avoided entirely. The placenta was attached to the posterior abdominal wall, the small intestine, and the posterior surface of the right broad ligament. There was a thick layer of fibrin on that portion of the placenta which could be seen. The placenta showed a mottling of necrosis with about half of the organ still vascular. No attempt was made to remove the placenta. The infant was delivered and the cord was cut short and tied. The abdomen was closed without drainage.

The patient's postoperative course was uneventful. During the first eleven days there was an elevation of temperature to from 100.8° to 99.4° F., after which there was no further fever.

She was discharged on the nineteenth postoperative day. At that time there was a rounded mass in the abdomen that reached 3 cm. above the umbilicus.

The patient was seen at frequent intervals following this. She had no complaint, and normal menstruation was resumed. The mass gradually decreased in size, but seven months after operation it still extended one fingerbreadth above the umbilicus and dipped into the pelvis below. It was about 10 cm. long and 6 cm. across. The fundus was average size and could be felt anterior to and adherent to this mass.

CASE 3.—The patient was a Negro woman 31 years of age, gravida i, para 0, whose last menstrual period was July 10, 1945. Five weeks later she developed a scant bloody discharge, had severe lower abdominal pain, and fainted.

During the fourth month there was a return of this pain and the patient was admitted to the hospital on November 9. Her temperature was 100° F., pulse 88, white blood cells 5,800, and hemoglobin 57 per cent. The uterus extended three fingerbreadths below the umbilicus, and a tender mass was felt in the left fornix and extending into the cul-de-sac. A diagnosis of uterine pregnancy and acute salpingitis was made. With chemotherapy the fever subsided and after receiving 500 c.c. of blood the patient was discharged on November 19.

Twice during the next six weeks she was readmitted for colicky pain, nausea and vomiting, abdominal distention, and obstipation. An x-ray of the abdomen showed multiple fluid levels in the intestines, and a diagnosis of intestinal obstruction was made. The condition responded promptly to the use of a Miller-Abbott tube, but after relief of the obstruction there was a tendency for recurrence of the attacks of abdominal pain. On one of these occasions the patient again fainted.

On April 10, nine months after the onset of the last menstrual period, the patient developed rhythmic pains and was admitted to the obstetric ward. The abdomen was enlarged to the size of a term pregnancy, and fetal heart tones were heard in the right lower quadrant. Small parts could not be outlined. The cervix was long and the os closed. Posterior to the cervix a firm mass about 6 cm. in diameter could be felt. Anterior to the cervix two smaller nodules could be felt. A diagnosis of uterine pregnancy at term with uterine fibroids blocking the pelvic outlet was made. It was decided that delivery should be done by cesarean section. Five hundred cubic centimeters of blood were given before taking the patient to the operating room.

On opening the abdomen a large oval mass which was thought to be the pregnant uterus was found. This was opened, and a 2½-pound living male child was extracted without difficulty. It was then seen that the mass was not the uterus but the sac of an abdominal pregnancy. The sac showed a rent in its posterior wall and its cavity contained several old organized blood clots. The placenta was adherent to the transverse colon, small intestines, and posterior abdominal wall. The fundus was the mass that had been felt in the cul-de-sac before operation, and it showed two fibroid nodules on its anterior wall.

At operation the fetal sac had been opened through a part of the placental site, and bleeding here was free. No attempt was made to remove the placenta, but there was profuse bleeding from the depth of the sac. Three five-yard gauze rolls were pushed into the sac, and the edge of the sac anchored to the peritoneal edges. The abdomen was closed, allowing space only for the exit of the drains.

The patient's condition was poor during the operation. She received stimulants and 1,250 c.c. of blood while in the operating room. On leaving the room her blood pressure was 75/30, pulse 120. She was treated for shock but did not respond, and died four hours after operation. Permission for autopsy

could not be obtained, but it was thought that due to the rent in the posterior wall of the sac the pack was not effective and that the patient died of internal hemorrhage.

The infant had no evidence of any defect, and three months after delivery is living and well.

I wish to express my thanks to Dr. J. H. Williams for allowing me to present the second of these cases.

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MATERNAL RH SENSITIZATION AND THE CLINICALLY NORMAL CHILD

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SINCE the Rh factor was first described⁶ and its relationship to erythroblastosis fetalis noted,¹⁰ comment has arisen as to the discrepancy between the number of instances of Rh-negative mothers with Rh-positive children (one out of ten pregnancies) and the incidence of erythroblastosis fetalis (one case in 200 deliveries). Various suggestions have been offered to account for this discrepancy; the following are examples: relative permeability of the placenta (Levine^{7,8}), size and combining powers of types of Rh antibody (Wiener^{13, 14, 16}), susceptibility of the individual to isoimmunization, the constitutional factor K, postulated by Wiener,¹⁶ competition of isoagglutinins (Wiener¹²), and the mother's history as regards transfusion (Levine⁹). As an additional factor, it may be suggested that cases are present in which mothers show transitory agglutinins and in which the babies show slight or no apparent damage; these cases are probably largely overlooked in the course of a busy obstetric practice.

Six cases of maternal sensitization with no evidence of erythroblastosis fetalis in the child have been observed in the Western Pennsylvania Hospital during the two years since the inauguration of the Blood Grouping Laboratory. In this period there have been 3,290 deliveries, 337 Rh incompatibilities between mother and child, and 18 cases of recognizable erythroblastosis fetalis. In each of the six cases mentioned, there was nothing apparent to suggest congenital hemolytic disease, yet in each case there was a period near the time of delivery when maternal sensitization to the Rh factor was demonstrable. Four of these cases are detailed below.

Report of Cases

CASE 1.—Mrs. I. T., was Group A, Rh negative. Her husband was Group AB, Rh positive. A 3-year-old son was Group A, Rh positive. A 5-year-old daughter was not available for tests. Both children were normal. Baby T. was a female child, Group A, Rh positive, born after a three-hour labor. There had been no miscarriages. The blood findings on Baby T. two days after birth showed red blood cells, 6,180,000; white blood cells 9,700; hemoglobin, 17 Gm., erythroblasts 30/100 white blood cells. Agglutinins were demonstrable in the baby's blood according to the method of Carter and Loughrey.¹ No blocking antibodies (Wiener¹⁵) were found. There was no appreciable jaundice or pallor, and neither hepatomegaly nor splenomegaly was apparent. The baby progressed normally, with artificial feeding, and left the hospital with the mother.

Two days after delivery, agglutinins demonstrable in the undiluted serum were found in the mother's blood. Anti-Rh agglutinins were found at the same

time in the breast milk, using the methods of Witebsky, Anderson, and Heide.¹⁷ Agglutinins were observable again in the maternal serum one month after delivery, demonstrable in the undiluted serum, but six weeks from the child's birth all Rh antibodies had disappeared from the maternal circulation.

CASE 2.—Mrs. A. L., was Group O, Rh negative. The husband was Group A, Rh positive. The history includes one living and well child, 5 years old, not available for tests, and one miscarriage at four months which occurred two years after the birth of the first child. Baby L. was born after a five-hour labor, a female child, Group A, Rh positive. Blood findings on the third day of life showed red blood cells, 5,320,000; white blood cells, 10,200; hemoglobin 15.5 Gm., erythroblasts 2/100 white blood cells. Except for a very slight jaundice, the baby progressed normally. Neither liver nor spleen was enlarged. The child was artificially fed. Agglutinins were demonstrable in the baby's blood, with no blocking antibodies observable; this work was done on the same day as the blood counts.

When six months pregnant, Mrs. A. L. had weak blocking antibodies in undiluted serum. These persisted without apparent increase in strength and at delivery at term, both anti-Rh agglutinins and blocking antibodies were found in the maternal serum. Blocking antibodies were present in a 1:3 dilution, and agglutinins could be demonstrated in a 1:10 dilution, using titration methods. Undiluted breast milk agglutinated Group O, Rh positive cells. At six weeks after delivery, agglutinins had disappeared; blocking antibodies were still present in undiluted serum.

CASE 3.—Mrs. L. R., Group A, Rh negative. Her husband was Group AB, Rh positive. There was one living child, a normal 10-year-old, by a former husband. This child was Group A, Rh positive. There were two miscarriages, both at two months, one five years and one seven years after the birth of the first child. Baby R. was born after a six-hour labor, a female child, Group B, Rh positive. Blood findings one day after delivery showed red blood cells 4,120,000; white blood cells, 11,150; hemoglobin, 15 Gm., erythroblasts 4/100 white blood cells. Except for slight jaundice, the child progressed normally, with no other findings suggestive of hemolytic disease except the low red cell count. The maternal blood showed agglutinins through a 1:3 dilution of serum, with no blocking antibodies, six weeks before delivery. These were present, but in no higher titer three days after delivery, but had disappeared in six weeks. Breast milk was not tested.

CASE 4.—Mrs. M. G., was Group B, Rh negative. The history had no miscarriages. The husband was Group B, Rh positive. Two older children, a three-year-old girl and a five-year-old boy, were both Group B, Rh positive. Baby G., a male child, Group B, Rh positive, was born after an eleven-hour labor. One day after delivery the blood findings were red blood cells, 5,920,000; white blood cells, 14,800; hemoglobin 18 Gm., erythroblasts 35/100 white blood cells. Hepatomegaly and splenomegaly were not demonstrable. The child showed slight jaundice, but appeared otherwise normal and was dismissed from the hospital with the mother. Artificial feeding was given from the beginning.

There was no evidence of maternal Rh sensitization during pregnancy. Two days after delivery, anti-Rh agglutinins were present in the mother's blood, demonstrable in undiluted serum only. There was no blocking reaction apparent. Agglutinins were found in undiluted breast milk and could be recovered from the child's blood. Evidence of sensitization did not persist to the six weeks' period.

Discussion

Each of these four cases has in common the agglutination of the child's cells and of Group O, Rh-positive cells by the serum of the mother, which ordinarily is diagnostic of sensitization of the mother to the blood of the Rh-positive child. In each of the two cases in which there was a discrepancy of the blood groups between the child and the mother, the mother's serum was titrated against appropriate cells to rule out isoimmunization against one of the blood groups. In no case was a high titer found: the highest was four plus in a 1:40 dilution. Maternal serums were tested for isoimmunization, using a number of different methods: the range was from the agglutinin tests and those for blocking antibodies through the newer methods employing albumin suspended cells. Each mother proved to be sensitized to the Rh factor when the serum was tested against cells suspended in an albumin medium, as in the methods of Diamond and Denton.² None of these mothers had received transfusions for any reason.

Dockeray and Sachs³ have reported cases in which maternal antibodies to Rh were demonstrable without clinical evidence of erythroblastosis fetalis in the child. Goldbloom and Lubinski⁴ have cited a similar case in their experience. Kariher and Miller⁵ have presented two such cases. It is probable that these instances are more common than is generally recognized, but that they do not come to the attention of the clinician or the laboratory.

Since both blocking antibodies and regular agglutinins are involved in this series, the failure of clinical hemolytic disease to develop in the children cannot be ascribed to the lack of one or another type of antibody. The choice would seem to lie between a theory of inaccessibility of maternal agglutinins to the baby's red cells, on the one hand, or, on the other, the postulate that the child is relatively immune, whether passively or actively, to the maternal antibody. As regards the first alternative, this is the theory favored by Dockeray and Sachs³; they suggest that antibodies pass the placental barrier only under certain conditions. However, in three of the four cases which we have considered above, antibodies to Rh were demonstrable in the child's blood. As concerns the second theory, it is possible that individual infants may vary in their ability to withstand the hemolytic or agglutinative effects of the maternal antibodies: that the infant blood may be protected, either through the lack of some substance necessary to complete the antigen-antibody combination or through the presence of a protective element. Kariher and Miller⁵ suggest that the secretion or nonsecretion of Rh substance by the child's tissues may be significant as regards maternal sensitization. Theoretically, if the child were a secretor of Rh substance the antibodies would be neutralized by this material as found in the fetal tissue cells, and thus much of the pressure removed from the child's red blood cells. Wiener has suggested that "X protein"¹⁶ may be the factor involved in the severity of congenital hemolytic disease. According to this concept, the stage of development of the child's serum proteins influences the outcome of the Rh negative—Rh positive incompatibility

in pregnancy. Levine and co-workers^{10, 11} believe that failure of the development of clinical hemolytic disease in the child of a demonstrably sensitized mother is due to a relatively short duration of intrauterine exposure to antibody. However, one of our cases showed demonstrable antibody when six months pregnant.

Since observation of the cases detailed above, none of the four women described has given birth to a child, although one is five months pregnant. It is interesting to speculate as to what the outcomes of future pregnancies may be. If the capacities of the child to resist the harmful effects of maternal antibodies are temporary with the individual, it is possible that later pregnancies with Rh-positive infants will end in hemolytic disease, since the mother had already become sensitized. However, if the relative resistance of the child involves a genetic characteristic, it is possible that future pregnancies will also have a satisfactory outcome.

In summary, four cases of maternal sensitization to the Rh factor are presented in which clinical manifestations of congenital hemolytic disease failed to develop in the children. It is suggested that this may not be an unusual phenomenon. Various theories are reviewed in an attempt to explain these findings.

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CAVERNOUS HEMANGIOMA OF THE FALLOPIAN TUBE

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CAVERNOUS hemangioma of the Fallopian tube has, to our knowledge, never been reported in the literature. Although hemangiomas are seen quite frequently, particularly in the skin, the infrequency with which they are encountered in the uterine adnexa makes this case worth while to be presented in the literature.

Schnedorf,¹ in a review of 205 cases of tumors of the round ligament, included a hemangioma which, according to him, was the first hemangioma of the round ligament to be reported. Orth² has reported a case of multiple congenital hemangiomas in both ovaries, skin, and other organs of a child. Gottschalk³ described a case of diffuse bilateral cavernous transformation in both ovaries. Braithwaite⁴ also reported a case of angioma of the ovary.

Case Report

A 28-year-old white woman, para i, gravida i, was admitted to the Cook County Hospital on Oct. 18, 1937, with complaints of lower abdominal pain for three months and dysmenorrhea for one year. For the past ten years, since marriage, there had been a brownish, nonodorous, scanty discharge.

Physical examination was essentially negative except for the pelvic examination which revealed a firm, pea-sized, whitish nodule on the left labium minor, also adnexal tenderness bilaterally, especially on the left side where a suggestive mass was palpated.

The clinical impression was that of tubo-ovarian disease and endocervicitis. On Oct. 24, 1937, the patient was operated upon, and a high defundectomy, a left salpingo-oophorectomy, and an appendectomy was performed.

Pathologic Findings: The specimen consisted of a fundus of a uterus, left tube and ovary, and appendix. The amputated portion of the uterus measured 3.5 by 4.5 by 2 cm.; the wall was 16 mm., thick, pale purplish-gray in color. The endometrium was 2 mm. thick and purplish-tan in color. The fimbriated end of the Fallopian tube was patent, the wall was tortuous, and the mucosa was dark purplish-gray. Attached to the mucous membrane of the tube, near the fimbriated end, was a polypoid mass which measured 1.5 by 1.5 by 1 cm. This mass was dark purplish red mottled by areas of greyish white, and appeared to fill the entire lumen of the tube. The ovary measured 3 by 2.2 by 1.5 cm. and on sectioning contained single follicular cysts up to 8 millimeters.

Microscopic sections were made of the nodule protruding into the lumen of the Fallopian tube including the wall of the tube. The microscopic picture revealed the node to be composed of large, dilated, cavernous vessels filled with red blood cells which replaced the stroma of many of the folds of the fimbriated end of the Fallopian tube. Many of the vessels were thin-walled and surrounded by an ample amount of dense fibrous connective tissue (Fig. 1). Some of the vessels showed somewhat thickened walls containing smooth muscle fibers (Fig. 2A). In addition to the vascular structures described above, there were remnants of papillae lined by high columnar epithelium whose interstitial stroma was replaced by numerous small, dilated blood capillaries surrounded by

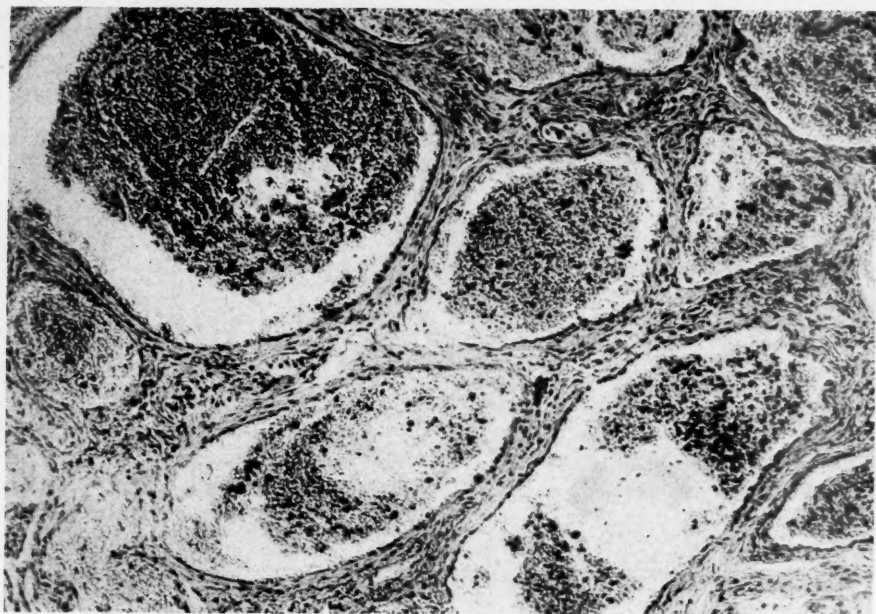


Fig. 1.—Showing dilated, thin-walled blood vessels surrounded by dense fibrous connective tissue. ($\times 80$.)



Fig. 2.—*A*, Thickened blood vessel walls containing smooth muscle fibers. ($\times 80$.)
B, Showing replacement of stroma of the papillary process of the mucous of the Fallopian tube by numerous thin-walled blood capillaries.

loose fibrous connective tissue (Fig. 2B). In other places the supporting stroma of the folds were thin and relatively avascular (Fig. 3). Many of the blood vessels in the wall of the Fallopian tube were markedly dilated and filled with blood. On the basis of the above findings a diagnosis of a cavernous capillary hemangioma of the Fallopian tube was made.

The patient made an uneventful postoperative recovery and was discharged from the hospital on Nov. 2, 1937.

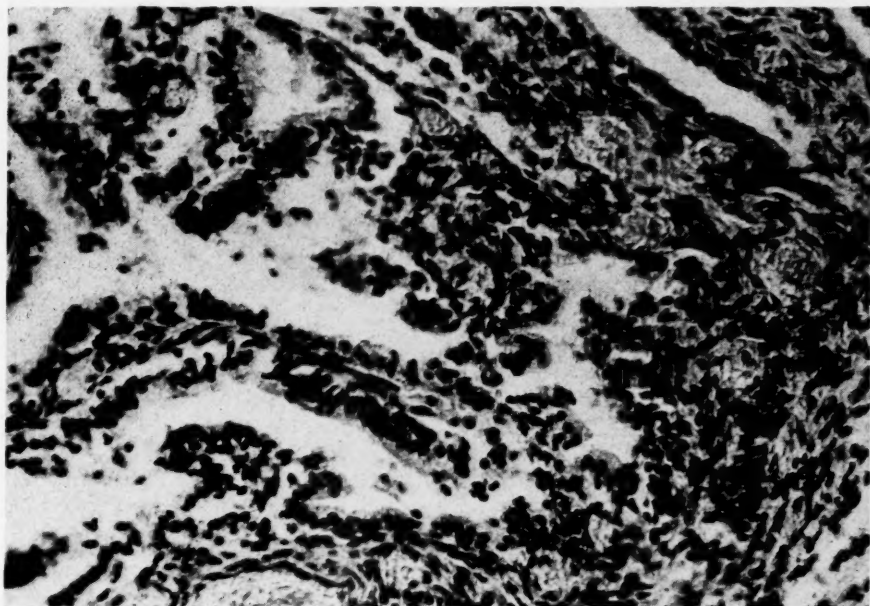


Fig. 3.—Papillary process of a Fallopian tube, lower center, showing delicate stroma supporting the columnar epithelial cells. ($\times 230$.)

Discussion

From the microscopic appearance of the tumor mass described in the Fallopian tube, it was evident to us that we were dealing with a true vascular neoplasm, particularly since many of the cavernous vessels demonstrated the presence of dense fibrous connective tissue surrounding the thin-walled, dilated blood vessels. This finding supports the view of Borst and Rindfleisch,⁵ who believe the fibrocellular growth in and about the wall of the capillaries play an important part in the development of the tumor. The retraction of this fibrocellular tissue tends to shorten the vessel resulting in dilatation on a mechanical basis.

As to other factors which may be involved in the production of dilated cavernous blood vessels, one can eliminate torsion or trauma in this case since the viability of the tissue was apparent and no extravasation of blood was noted in the folds or wall of the tube. Inflammatory changes, we feel, as characterized by the formation of vascular granulation tissue, does not play a role in the tumor reported here. In our case the folds are well preserved and the supporting stroma of the folds, in places, shows a marked angiomatous appearance of the small capillaries with no infiltration of lymphocytes or polymorphonuclear leucocytes. Where the characteristic vascular angiomatous structure is not apparent the normal stroma prevails.

Summary

A case of cavernous hemangioma of the Fallopian tube is reported, the first to appear in the literature. A brief discussion as to the pathogenesis points to the lesion herein described as a true neoplasm.

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TRUE LITHOPEDION—INCIDENTAL FINDING AT NECROPSY AND REVIEW OF THE LITERATURE

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AS HAS already been noted, the finding of lithopedions is now rare, because of the more frequent diagnosis of extrauterine pregnancy and early surgical intervention. The incidence of 1.5 to 1.8 per cent, as quoted by Schumann, is acceptable, though he thought these figures were too high.

Reeves and Lippman,¹ in 1941, brought the grand total of reported cases to approximately 236, covering the literature of nearly five centuries. Since then ten additional cases have been added by Gigl,² Ogden,³ Wanderley,⁴ Kelkar,⁵ Doneluzzi,⁶ Tractenburg,⁷ Mayer and Berson,⁸ Biskind,⁹ Penick,¹⁰ Sant-Anna.¹¹ All of these cases meet the requirements set forth in the classification of lithopedions as proposed by Kuechenmeister.¹² All are single cases, many associated with other abnormalities of pregnancy. These ten, with the one herein reported, bring the grand total to approximately 247 cases.

Kuechenmeister¹² noted that calcification is not entirely limited to the fetus, but may involve the membranes and placenta, or be entirely limited to the placenta. On this basis he proposed the division into three groups:

1. Lithokelyphos (stone sheath or egg shell), in which the membranes alone are calcified and form a hard shell surrounding the fetus. The fetus may undergo slight change only or may be completely skeletonized, but is not involved in the process of calcification.
2. Lithokelyphopedion (stone-sheath child) in which both the membranes and the fetus are calcified.
3. True lithopedion (stone-child) in which the fetus is infiltrated with calcium salts and calcification of the membranes is negligible.

The present case meets all criteria laid down and is unusual in that it was present for at least thirty years, asymptomatic, and remained undiagnosed during life.

Case Report

A woman, aged 74 years, was admitted to the medical service of Queens General Hospital with a history of rheumatic fever at the ages of 16 and 31 years, and progressive dyspnea, orthopnea, and ankle edema. She had three grown children and recalled no episode of miscarriage, unusual menses, or bouts of severe lower abdominal pain.

The patient died four days after admission. At necropsy a completely calcified mass measuring 7 by 5 by 3 cm. (Fig. 1) was found lying free in the posterior cul-de-sac attached by thick adhesions to the superior aspect of the posterior uterine wall and sigmoid colon. There was no encroachment on either of these organs. The external surface grossly revealed four calcified extremities with detailed impregnation of distal phalanges, and the vertebral bodies could be well established.

X-ray of the specimen in both anteroposterior and lateral views revealed a complete vertebral column with bodies, spinous processes, and transverse processes well made out, as well as the bones of all four extremities.

On section of the mass, calcification extended inward for a distance of $\frac{1}{2}$ cm. Necrotic material was densely scattered within deposits of calcium salts. Microscopy shows no tissue which could be definitely identified histologically, and there was a dense and irregularly clumped infiltration by calcium salt deposits. The specimen was classified as a true lithopedion.



Fig. 1.—Lithopedion with lower extremity below and upper extremity above—middle shadow area, and ovoid lighter zone corresponding to head of fetus. Above is seen a folded darker mass of tissue which is sigmoid colon attached by dense fibrous adhesions.

Not all calcified masses in the pelvis are lithopedions. Another instance of a completely calcified mass in the identical location in the posterior cul-de-sac is presented for comparison. This mass measured 2 by 2 by 2 cm., and was attached by thick adhesions to the posterior uterine wall and sigmoid colon in the posterior cul-de-sac. It also presented an incidental finding at necropsy in a case of arteriosclerotic heart disease and congestive failure. A careful history served to rule out a possible lithopedion in this instance. This was confirmed by the histological picture which showed calcification of lobulated fat tissue with preservation of the reticulum structural pattern of fat tissue. The mass was completely calcified and the final decision was that it represented a calcified epiploic appendage. Several such instances have been seen in this laboratory and they undoubtedly represent secondary calcification in an epiploic appendage which has undergone infarction changes due to torsion of its pedicle.

Summary

A case of a true lithopedion which was an incidental finding at necropsy is added to the literature and brings the total to 247 instances. The lithopedion was asymptomatic and undiagnosed though present for at least thirty years.

A second instance of a calcified mass in the identical location proved to be a calcified appendage epiploica.

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MIGRATION OF OXYURIS VERMICULARIS TO LYMPH NODE OF ROUND LIGAMENT

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INVASION of the upper portion of the female genital tract by *Oxyuris vermicularis* is not rare. It has been found in the Fallopian tubes¹ and has been reported as the etiologic agent in a case of pyosalpingitis.² Goodale and Kirschner³ found it imbedded in the peritoneum in one case and cited six other similar cases, all of which, including their own, were in women. They felt that the worm gained entrance to the peritoneal cavity by way of the genital tract. They also cited a reported case of oxyuris ova in lymph glands contiguous to an appendix in which an adult worm was found. The present case is presented to report the finding of the adult worm and ova encapsulated in a lymph node on the round ligament. So far as we are aware, this site has not been previously noted.

The patient, a 26-year-old housewife, reported to us two months after her third delivery because of lower abdominal discomfort with sense of pressure. Examination revealed a rectocele of moderate size and an apparently enlarged uterus probably due to leiomyomata. Enlarged cervical and inguinal lymph nodes were also present. Otherwise, all physical findings were normal. The Friedman test was negative. The blood count was normal (hemoglobin 14 Gm., erythrocytes 4,500,000, and leucocytes 6,500, of which 64 per cent were neutrophils, 30 per cent lymphocytes, 2 per cent monocytes, and 4 per cent eosinophils), and the Kahn reaction of the blood was negative. Because of the short interval which had elapsed since the last delivery, the patient was advised to postpone any surgical procedure for the pelvic condition for six months. This interval would also provide an opportunity to evaluate the significance of the lymphadenopathy. Increase in the symptoms and in the size of the pelvic mass during the next month, however, necessitated earlier intervention. During this time there had been no change in the cervical and inguinal lymph nodes, and the blood count remained within normal limits. The patient therefore entered the hospital for repair of the rectocele and exploration of the pelvis.

Upon opening the abdomen the mass was found to be not an enlarged uterus but a large left ovarian cyst which proved to be a benign serous cystadenoma. The left tube and ovary and the appendix were removed. In picking up the left round ligament to fasten it over the uterus in such a manner as to cover the raw surface, a nodule, 8 mm. in diameter, was found on the round ligament not far from its uterine end for which no explanation was apparent. It was removed for microscopic study. Upon examination the nodule proved to be a lymph node within which a gravid female *Oxyuris vermicularis* and ova were encapsulated (Figs. 1 and 2). Later questioning revealed no history suggestive of infestation with the nematode, and examinations of the stool and vaginal smears were negative for it. It was felt that the pathologic lymph node was an incidental finding and probably played no part in the patient's symptoms, since both worm and ova were well encapsulated. The patient's convalescence was uneventful, and she was discharged from the hospital on the thirteenth post-operative day.

The microscopic picture of the lymph node which was removed was that of a granuloma. The granuloma was sharply circumscribed by a fibrous capsule. In the center, surrounded by leucocytes, was the cross section of the worm irregularly 500 by 600 microns. It was filled with ova and there were many ova

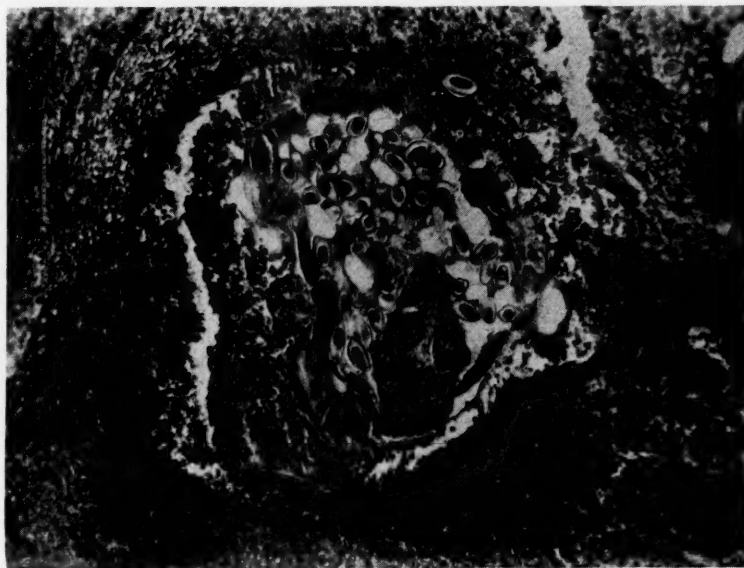


Fig. 1.—Cross section of gravid female *Oxyuris vermicularis* contained in granuloma of lymph node. (Photomicrograph $\times 100$.)

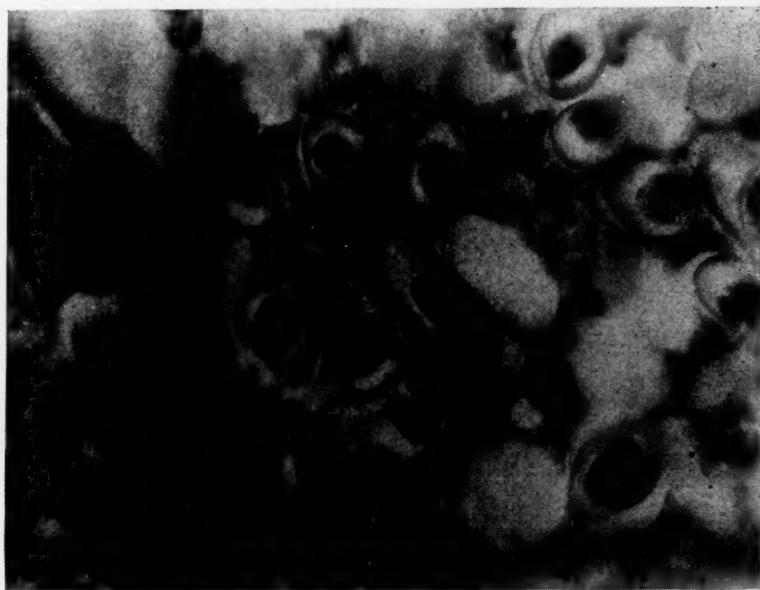


Fig. 2.—Ova in cross section of *Oxyuris vermicularis* found in lymph node. (Photomicrograph $\times 400$.)

lying free in the adjacent area. Surrounding the worm was a wide zone of coagulation necrosis. Between this and the capsule was a relatively narrow zone of productive fibrosis which contained many young capillaries, and was intensely infiltrated with leucocytes including many eosinophils. All sections of the specimen showed several small, discrete collections of lymphocytes lying just beneath the capsule. The appearance of these areas suggested that they were remnants of lymph node structure.

Later, the most accessible inguinal lymph node, which was on the right side, was removed for study. There were considerable fibrous thickening of the capsule and of the trabeculae, hyperplasia of the lymphoid follicle, a moderate number of eosinophiles throughout the node, and considerable thickening of the arteries and veins, but no parasites nor ova were found.

The route by which the worm reached its final resting place is open to speculation. The rich lymphatic supply to the round ligaments from the Fallopian tubes and uterus makes it interesting to postulate a direct route from the uterus to the round ligament by way of the lymph channels, but the size of the adult worm (cross section 500 by 600 microns) would seem to make this route an impossibility. We know that worms and ova have been found in the genital tract of women and in the peritoneal cavity. This route, therefore, is not beyond the realm of possibility even though it is difficult to conceive that a worm free in the peritoneal cavity would find its way to a lymph node of the round ligament without first coming to rest at some more accessible site. The fact remains, that any indication of the manner in which the worm reached its final resting place is lacking.

Summary

The finding of *Oxyuris vermicularis*, both the adult gravid worm and ova, encapsulated in a lymph node of the round ligament, is reported. The enlarged lymph node was discovered during the course of removal of a large ovarian cyst.

I am indebted to Dr. James D. Edgar, Pathologist at Mercy Hospital, and to Dr. H. S. Sumerlin, Pathologist at the Rees-Stealy Clinic, for the pathologic studies in this case.

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DYSGERMINOMA OF THE OVARY IN A 7-YEAR-OLD CHILD

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(From the Department of Gynecology, Harford Memorial Hospital)

THE patient, a girl aged seven years, was admitted to Harford Memorial Hospital on August 12, 1946, with the complaint of fever, nausea and vomiting, and pains in the abdomen of several days' duration. The father stated that the child had felt fairly well and that he did not notice any abnormality until a few days previously. The findings on admission revealed a poorly nourished, rather pale looking female child, who breathed with considerable difficulty and whose expression was rather anxious and fixed. The abdomen was distended symmetrically and a large, somewhat nodular tumor filled the entire abdomen, from the symphysis pubis and extending to the xyphoid process. The mass was rather elastic but firm in consistency, tender in some areas and, as a whole, was quite fixed. The tumor did not shift with change of position; there were no signs of ascites or areas of fluctuation. The skin overlying the neoplasm was readily movable, and there were large dilated veins over the entire abdominal wall. The external genitals were normal for a child of her age. Rectal examination revealed that the lower pole of the tumor extended deep into the cul-de-sac, was somewhat tender, and apparently well fixed. Temperature, 101.6° F.; pulse, 128; respiration, 24; red blood cells, 2,780,000, white blood cells, 11,200; hemoglobin, 57 per cent; sugar, negative; albumin, negative. Roentgen examination showed a large mass in the anterior portion of the abdomen, displacing the colon and small intestines backward. The edge of the tumor could not be seen in the anteroposterior view, but the kidney shadow and both psoas shadows were obscured. Examination of the chest showed an elevation of both sides of the diaphragm; the lung fields were clear. Intravenous pyelogram showed very little secretion in the left kidney. Right kidney showed a marked dilatation of the kidney pelvis and ureter. One large blunted calyx was shown on the left side, probably in the lower pole. Examination seemed to indicate that the mass was connected with the genital or urinary tract rather than an enlarged spleen.

At operation, there was found a solid tumor which extended from the pelvis almost to the xyphoid process. The incision was enlarged superiorly and the tumor freed by sharp and blunt dissection with considerable difficulty from the posterior abdominal wall, the lateral walls of the pelvis, and posterior cul-de-sac. It was lobulated in appearance, conformed to the shape of the pelvis and the abdomen, forming a mass roughly the shape of a watermelon. Posteriorly, the pelvic walls had been bared by the dissection and one could see the ureters, pelvic vessels and the abdominal aorta which had been exposed. The tumor could be seen arising from the left ovary. It was rather rubbery in consistency, grayish in appearance and there were numerous hemorrhagic areas over the entire posterior surface. A small portion of the anterior aspect was covered by a thick glistening capsule. The mass was solid throughout with no evidence of cystic degeneration and was apparently sarcomatous in nature. A supravaginal hysterectomy, bilateral salpingo-oophorectomy was done by the customary technique; the stump of the cervix being suspended by the round and broad ligaments and the combined stumps then being completely peritonealized by the reflection of the uterovesical peritoneum. All bleeding points were carefully ligated; several grams of sulfanilamide sifted into the pelvic cavity and the posterior peritoneum closed by a continuous No. 1 plain catgut suture.

The abdomen was then closed as quickly as possible with silkworm gut, in one layer, as the patient was not standing the procedure very well. She was given two pints of plasma during the operation and received 500 c.c. of whole blood on returning to her room.

Pathologists Report.—*Gross:* The specimen consisted of an irregular lobulated mass which had been separated into two pieces, one measuring 15 cm. by 15 cm., the smaller mass, 11 cm. by 6 cm. The left ovary was matted together with the tumor mass, and the attached tube was greatly elongated over the growth. The neoplasm was covered partly by a glistening dense capsule, outer surface nodular, with numerous hemorrhagic areas on its posterior aspect. The cut surface was grayish with areas of necrosis, degeneration, and hemorrhage. A small infantile uterus and a normal right tube and ovary composed a separate specimen.

Microscopic: The bulk of the tissue consisted of rather pleomorphic medium-sized to large tumor cells with oval or round hyperchromatic nuclei and abundant acidophilic cytoplasm. The cytoplasm in some areas was elongated, and suggested muscle fiber. The larger cells were more epithelial in character. Cellular areas alternated with rarified myxomatous tissue. There was diffuse infiltration and focal collections with lymphocytes which was in favor of dysgerminoma. There was also a tendency of cells to form fasciculi. The capillaries were numerous and surrounded by tumor cells. Other areas showed extensive necrosis leaving shadow cells. In another section, there was capillary dilatation and focal hemorrhage. Here the tumor was more cellular and the cells were embryonic in type. These histologic findings were similar to those described by Meyer as being characteristic of dysgerminoma.

After the operation, there was a sudden rise of temperature to 105° F., but by the second postoperative day, it reached 102° F. She was given a course of penicillin which was continued until the temperature reached normal on the fifth postoperative day. While blood was administered immediately after the operation along with intravenous glucose. The patient voided involuntarily for several days but after a course of prostigmine, she voided without much difficulty. On the eighth day, the skin sutures were removed and her incision had healed well. She was allowed out of bed on the seven day and was discharged on the eighteenth day in an improved condition. Two weeks later, she was transferred to Bon Secours Hospital, Baltimore, where she was given a rigid course of deep x-ray therapy. The patient did not improve to any great degree and, after a steadily downhill course, expired on Nov. 7, 1946, approximately three months after her operation.

Editorial

The Third American Congress on Obstetrics and Gynecology

The Third American Congress on Obstetrics and Gynecology was held in the Municipal Auditorium, St. Louis, Mo., Sept. 8 to 12, 1947, and was highly successful from all aspects.

There were more than 1,500 advance, and 500 paid registrations at the Congress. Actually in attendance were 1,307 of these 2,000 paid registrants, and over 1,000 additional people, a total of more than 2,300. The bulk of those attending were physicians and nurses, but there was a generous admixture of others with interests touching the combined specialty. This was the largest attendance of the three American Congresses, including many Canadian, Mexican, and South American colleagues. They were most welcome, and a cordial invitation is extended to them to participate in future American Congresses, especially the next, which is to be jointly an International, and the Fourth American Congress.

The scientific sessions were well attended. Mornings were devoted to general meetings, in the form of panel discussions, at which the nation's outstanding authorities discussed "Anesthesia and Analgesia," "Cancer of the Cervix," and "Cesarean Section." Each afternoon from 2:00 P.M. to 3:45 P.M. there were two, and sometimes three section meetings. From 4:00 P.M. to 5:00 P.M. at least five round tables were held daily, and were so popular seats were at a premium.

The American Society for the Study of Sterility, and the National Federation of Obstetric and Gynecologic Societies each was responsible for a segment of the program, a plan truly embodying the fundamental idea of a "congress."

More than sixty manikin demonstrations were given. These were acclaimed at the Second, and well received at the Third Congress. The motion picture program was almost too full, since each film was shown but twice, despite the fact the theater was in continuous operation each day.

Thirty scientific exhibits offered a wide variety of subject material. The prize was awarded to Doctors Flexner, Vosburgh, and Cowie of Baltimore, who presented "Sources of Fetal Iron and the Permeability of the Placenta to Iron as Demonstrated with Radioactive Iron."

Ninety-seven booths were occupied by technical exhibitors, demonstrating every variety of drug, instrument, and service in the field of obstetrics and gynecology.

The scientific papers presented at the various sessions, together with the accompanying discussions, will be published in a special volume of *Transactions* at a later date.

The success of the Third American Congress on Obstetrics and Gynecology was outstanding, and it was decided to expand it to international proportions in 1950. Further announcements will appear in subsequent issues of the JOURNAL.

Department of Reviews and Abstracts

Selected Abstracts

Pregnancy

Glass, S. J.: **The Importance of the Liver in Reproductive Physiology**, West. J. Surg. 55: 114, 1947.

The liver plays a dominant role in the inactivation of the estrogens. The work of Talbot is quoted which showed that in female rats in whom the liver had been partially damaged with carbon tetrachloride the uterine weights increased almost 100 per cent. When the rats were castrated, no such change was observed. It is concluded that the damaged liver, unable to inactivate the endogenous estrogen, a high estrogen level results. The author has reported the presence of gynecomastic and testicular atrophy. In males suffering with cirrhosis of the liver, free estrogen may be recovered in the urine. Impairment of spermatogenesis probably resulting from accumulated estrogen has been observed in hepatitis as well as cirrhosis. Such estrogen tends to suppress gonadal function in both male and female. Appreciation of this liver-gonadal relationship may open new therapeutic vistas in endocrinology.

WILLIAM BICKERS.

Hellman, L. M.: **The Effect of Aging on the Course and Outcome of Pregnancy**, J. Gerontology 1: 418, 1946.

The author discusses the effect of the age of the mother in the maternal and infant well-being in both primiparous and multiparous women aged 35 to 45 years. The hazards to pregnancy which undoubtedly increase in this age group should serve as warning posts that additional care must be taken when the mother is over 35 years. The author states that many radical procedures have been advocated to bring about a successful termination of pregnancy but he also thinks that these procedures must be carefully evaluated before they can be executed. In addition to the medical complications of middle age such as heart and kidney disease and diabetes, the risks to the mother include the pregnancy complications of toxemias and myomas. He states that it has been the policy of the Johns Hopkins clinic and probably the teaching clinics throughout the country to allow these older patients to deliver normally from below if the antenatal course, pelvis, presentation, birth canal, and labor are all normal. He also states that it has not been the experience there that the labors of older primiparous women are prolonged or more difficult than those of their younger sisters. However, in the age group 35 to 39 years, abdominal delivery was resorted to in 16 per cent of cases while in the 40- to 45-year age group, section was performed in 44 per cent of these cases. It would seem that the difficulties would be somewhat lessened in the case of the multiparas in the older age group but the author feels that this is not the case. The basis of maternal risk is again heart and kidney disease and diabetes while the immediate pregnancy complications are toxemia, myomas, together with increased incidence of premature separation of the placenta and spontaneous rupture of the uterus. The maternal mortality in the age group 40 to 45 years, comprising 330 deliveries, increased to 1.8 per cent. The factors of malpresentation and premature separation increased in the 35- to 45-year age group and contributed not only to the maternal but also to the fetal death rate. Age not only has a deleterious effect upon the mother but also upon the rate of fetal wastage and formation. The author states that an analysis of 16,312 deliveries occurring at the Johns Hopkins Hospital during the last decade showed the stillbirths and neonatal mortality rate was 72.8 per thousand viable births in the 206 patients over 35 years. This represents a definite increase

from the rate of 57.7 quoted previously for all *prima gravida* patients regardless of age. There is an additional factor which was discussed by the author. He states that there is a diminution of the reproductive vigor as maternal age advances and the incidence of fetal abnormalities and certain congenital diseases such as mongolism and achondroplasia increases. He quotes the classic studies of Eleyer which seem to show that there is a tendency for mongoloid infants to be born to older mothers averaging 41 years. In view of all these factors, the author states that the greatest talisman of the young married woman is youth and that the formation of her family should not be too long delayed.

The hazards of pregnancy, both to mother and child, increase with the age of the mother. Maternal and infant mortality rates increase, both in *primiparous* and *multiparous* women. The medical complications of middle age, such as heart and kidney disease, hypertension, and diabetes, and such complications of pregnancy as toxemia, myomas, and malpresentation increase with the age of the mother and the number of children she has previously borne. In addition, there is a higher incidence of fetal abnormalities and certain congenital diseases from the age of 30 years onward. Since 14 per cent of all births occur to mothers 35 years of age and above, these hazards of pregnancy are most important and should be carefully watched.

EDWARD C. HUGHES.

Crew, F. A. E.: Twins and Triplets, Quadruplets and Quintuplets; Some Facts and Fallacies, Practitioner 158: 233, 1947.

Twins may be monovular or binovular; if monovular, developing from a single ovum fertilized by a single spermatozoon, the twins are genetically the same and of the same sex. Binovular twins may be of different sex and may differ genetically as any two siblings. The same statements apply to monovular and polyovular multiples. It must be remembered, however, that monovular and polyovular multiples cannot always be distinguished by differences in their embryonic membranes. Monovulars usually have a single chorion, but if the division into separate embryos has occurred relatively late they may be *polychorionic*. Similarly polyovulars are usually *polychorionic*, but fusion of the original separate membranes may have occurred so that they seem to be single.

While it has been suggested that a greater frequency of multiple births might be an aid in maintaining the growth of the population, the author points out that premature births, stillbirth, and birth injuries occur much more frequently in multiple births; neonatal mortality is also higher.

The study of twins, or of triplets, quadruplets, and quintuplets is of special interest in regard to determining the relative importance of heredity and environment, especially in the cases of monovulars. Monovulars are genetically identical, and any differences that they present must be the result of environmental factors; such environmental factors may be *intrauterine* or *extrauterine*. There are a few characteristics that are determined by hereditary forces, such as blood group, eye color, and sex, but most characteristics are the product of the interaction of heredity and environment. Comparative studies of monovular and polyovular multiples would also be of value in determining the relative importance of etiologic factors in disease—the predisposition of the individual and the immediate provocative cause in the environment. Because of this, special attention should be given to multiples, as scientific methods of prevention and treatment of disease depend upon accurate knowledge of etiology.

HARVEY B. MATTHEWS.

Pregnancy, Complications

Johnson, Herman W.: Sudden Death in Obstetrics, Arizona Med. 3: 225, 1946.

When sudden death occurs in the obstetric patient the causes may be reduced to residuum of (1) obstetric shock, (2) hemorrhage, and (3) combination of shock and hemorrhage. Accidental shock as the cause of sudden death in the obstetric patient comprises the largest group. Shock appears most frequently in cases of (a) *pre-eclampsia* and *eclampsia*, (b) *dystocia* from any cause followed by exhaustion, dehydration, blood loss, and (c) *anaphylactoid* re-

actions following blood transfusion and drugs. In the group of accidental deaths, the author includes pulmonary embolus, pulmonary atelectasis, air embolism, acute dilation of the stomach, rupture of a large extragenital vessel, or aneurysm and congestive heart failure.

For treatment the author recommends (1) continuous oxygen as cell anoxia increases the shock, (2) blood plasma in much greater quantities than is generally used in hemoconcentration and whole blood where hemodilution is present, and (3) adrenal cortex as a regulator of capillary tension.

WILLIAM BERMAN.

Friedman, Louis L., and Garber, J. R.: Pregnancy and Tuberculosis; the Present Status of the Problem, Am. Rev. Tuberc. 54: 275, 1947.

A review of the literature is presented on the effect of pregnancy on tuberculosis. This shows that it is now generally accepted that pregnancy has little or no influence on the incidence or course of tuberculosis. Therapeutic abortion is rarely indicated because of tuberculosis; and should never be attempted after the first trimester of pregnancy. Tuberculosis must be treated in the pregnant woman as in the nonpregnant; if pneumothorax is indicated it should be carried out during pregnancy. Even bilateral pneumothorax may be employed if the disease is bilateral. One of the authors (L. L. F.) has had two patients in whom bilateral pneumothorax was done during pregnancy, who were safely delivered of normal living children. The best results are obtained if tuberculosis is discovered and treated actively before pregnancy occurs. The early recognition of tuberculosis in women of childbearing age will be aided by the various methods of mass x-ray examination of the chest; their use in prenatal clinics is also advised.

If the tuberculosis is discovered and treated before the patient becomes pregnant, many authorities believe that pregnancy should not be advised until one to three years after the disease has been arrested.

When a tuberculous patient is pregnant arrangements should be made well in advance for hospitalization of the patient for delivery, if possible in a tuberculosis sanatorium that is equipped for special care for mother and child. When delivery is from below, episiotomy and/or low forceps should be employed to shorten the second stage of labor. Cesarean section may be done; some obstetricians consider cesarean section the method of choice for delivery of tuberculous mothers, but the authors are of the opinion that it is the procedure of choice only when there is some obstetric indication for operative delivery, or if sterilization of the patient has been agreed upon.

It has been found that 81 per cent of the children of tuberculous mothers are delivered alive, and that most of these children are normal in every respect. But special precautions must be taken at the time of delivery, and mother and child must be separated immediately to avoid infection.

HARVEY B. MATTHEWS.

Hamilton, Burton E.: Heart Disease in Pregnancy, Missouri M. A. 44: 17, 1947.

At the Boston Lying-In Hospital, 17 of every 1,000 women have rheumatic heart disease; these women have contributed to the maternal deaths 140 out of every 1,000 deaths. It is thus evident that pregnancy in a woman with heart disease constitutes a real problem to the obstetrician.

Regular examinations of a woman with cardiac disease should be made after marriage, as the cardiac status may change at any time. Even the fact that a woman has survived one pregnancy does not ensure her safety in the next pregnancy. Pregnancy is safer for women who are able to live reasonably normal lives without showing cardiac symptoms and have no complication than in those who show signs of heart failure while normally active and who have some complication, especially hypertension. The maternal death rate in the latter group is 16 per cent. In patients with auricular fibrillation, the outlook is still more unfavorable, the maternal death rate being nearly 33 per cent. Recurrences of rheumatic fever in patients with chronic rheumatic heart disease are rare in pregnancy; but most of such recurrences occur in young women under 23 years of age. In women over 35 years of age

there are twice as many instances of congestive heart failure during pregnancy as in younger women. The safest age period for pregnancy in cardiac patients is, therefore, between 23 and 35 years of age. Involvement of the mitral valve alone is more favorable than involvement of the aortic valve alone. The most favorable cases are those in which there is only moderate enlargement of the heart and a loud apical systolic murmur.

A study of the time of occurrence of heart failure in pregnancy in cardiac patients and of the circulatory changes in normal pregnancy shows that failure does not occur in uncomplicated cardiac cases before the sixth month of pregnancy; it is most frequent in the seventh and eighth months; and rare in the ninth month; and that the circulatory load of pregnancy begins to become heavy in the sixth month, increases in the seventh and eighth months, and decreases again in the ninth month. Therefore delivery before term is not indicated in cardiac patients, as the circulatory load is decreased near term.

Throughout pregnancy the cardiac patient must be under careful supervision and on a carefully planned regime which must be followed exactly. If the patient shows signs of embarrassment of the circulation and respiration, her activity must be still further restricted. If symptoms of congestive heart failure develop, she must be kept in bed under hospital conditions. Both sodium intake and fluid intake should be restricted in cardiac patients during pregnancy. With such a regime the maternal mortality of cardiac patients can be reduced, and, in the author's experience, has been reduced.

Studies of hypertension in pregnant women have indicated that women with hypertension are no better off than women with rheumatic heart disease in relation to the risk of pregnancy. Much more study of hypertension in pregnancy and of the effect of pregnancy on hypertension is necessary.

HARVEY B. MATTHEWS.

Puerperium

Perabo, Franz: Investigations Upon the Shift of the White Blood Cell Count and the Sedimentation Rate in the Afebrile Puerperium, Gynaecologia 122: 15-62, 1946.

Perabo, at the University of Zurich Woman's Clinic, conducted unusually detailed investigations on the hemoglobin, the total white blood cell counts, differential white blood cell count and the hematocrit determinations upon nearly 200 afebrile puerperal cases. Nearly all the cases were examined in the delivery room with decreasing numbers upon the fifth, ninth, twenty-first, and forty-second postpartum day; 217 cases at the time of delivery, 195 cases upon the fifth and ninth days; 45 cases, the twenty-first days, and 26 to 30 cases upon the forty-second day.

Using 200 cells for each count, modified Giemsa stain and biostatistical methods, the author observed that the leucocyte count was slightly raised (12,100 with a mean deviation of 3,000) during labor, became approximately normal on the fifth day (7,900 with a mean deviation of 1,800) and absolutely normal on the ninth day postpartum (6,900). Perabo states an increase of leucocytes in the puerperium of more than 1,000 above the 6,900 figure must be due to a special cause and not ascribed to the puerperium itself.

The sedimentation rate accelerated up to 50 mm. during labor showed a gradual decrease in rate although still remaining slightly increased over the average nonpuerperal figure at the end of the sixth week. The author was unable to demonstrate any significant correlations of the hemoglobin on the sedimentation rate. The article is well illustrated with tables and charts.

C. E. FOLSOME.

Lovelady, Sam B., Randall, Lawrence M., and Hosfeld, S. Marjorie: Levels of Penicillin in the Blood After the Use in the Vagina and Rectum of Suppositories Containing Penicillin Calcium; Preliminary Report, Proc. Staff Meet., Mayo Clin. 21: 401, 1946.

In the first part of the study suppositories containing 100 units of penicillin calcium were placed in the rectum or vagina of postpartum patients without complications, while they were confined to bed. In 36 cases the suppository was placed in the vagina, and in 33 cases in the rectum. The level of penicillin in the blood was determined three and five hours

after the suppositories were inserted by the slide-cell technique. Significant levels of penicillin were found in the blood after one, two, or three suppositories, the levels being somewhat higher after vaginal than after rectal suppositories. Vaginal penicillin suppositories were used in a small group of ambulatory patients with acute vaginitis; this resulted in rapid symptomatic improvement and local healing. The results of these studies indicate that penicillin suppositories might be used as a routine measure in preparing patients for delivery, especially when premature rupture of the membrane has occurred. Penicillin suppositories might also be used in preparing patients for cesarean section and for vaginal or abdominal hysterectomy.

HARVEY B. MATTHEWS.

Radiation

Haman, John O.: X-Ray Irradiation to Promote Ovulation, West. J. Surg. 55: 107, 1947.

X-ray irradiation to pituitary and ovaries for the treatment of amenorrhea is again recommended. The observation that fetal abnormalities in certain animals may occur in the second or last generation following irradiation has militated against its use in the human. The author believes that its danger has been exaggerated. The basal temperature curve has been used as a basis for determining the ovulation salvage following treatment. The technic employed has varied, but in each case the pituitary and ovaries were radiated. The number of treatments was three.

Eighteen patients were treated and of this group 12 whose chief complaint was sterility and amenorrhea became pregnant. The offspring were normal in all the patients who carried to term. Restoration of normal menstrual function as shown by basal temperature and biopsy was obtained in 71 per cent of 32 cases with secondary amenorrhea.

In a discussion of this report Dr. Rubin confirmed from his own experience the observations here recorded and states that low dosage, irradiation of the pituitary and ovaries in amenorrheic, sterile women is today the most satisfactory method of treatment.

WILLIAM BICKERS.

Venereal Diseases

Olansky, Sidney, and Beck, Robert: Rapid Treatment of Prenatal Syphilis, Am. J. Syph. Gonorr. & Ven. Dis. 31: 51, 1947.

The authors give the following conclusions on this article:

1. Intensive treatment of prenatal syphilis offers the best outlook for the prevention of congenital syphilis. It is essential that quantitative serologic tests for syphilis and careful physical examinations be performed monthly during pregnancy so that in the event of infection, reinfection, or relapse, re-treatment may be instituted in time to prevent congenital syphilis.

2. Intensive antisyphilitic treatment even late in pregnancy results in a very high incidence of nonsyphilitic infants.

3. The cord serologic test for syphilis appears to be of little value in a diagnosis of congenital syphilis.

4. The incidence of untoward reactions in all three regimes here employed was very low, particularly with the schedules employing penicillin alone and penicillin, arsenic, and bismuth in combination.

C. O. MALAND.

Porter, J. R.: The Positive Serological Reaction Is Not a Diagnosis of Syphilis, Illinois M. J. 71: Feb., 1947.

A plea is made for wider recognition of the prevalence of false positive serologic tests for syphilis. The author points to the nonspecificity of these tests and the variety of disorders of serum protein which will give positive reactions. He therefore urges that a diagnosis of syphilis should rest on clinical as well as laboratory data, and that treatment should be withheld until such definite clinical evidence is forthcoming in any given patient. S. B. GUSBERG.

Guerriero, Wm. F., and Mantooth, W. B.: Syphilis of the Cervix, South. M. J. 40: 261, 1947.

The cervix is a common portal of entry for the *Spirocheta pallida*. The chancre of the cervix, due to its environment, loses very early in its development the characteristic induration and rolled edges, its appearance soon becoming indistinguishable from a simple erosion. Secondary lesions of syphilis are gray-white in color which may resemble other benign cervical lesions. Repeated dark field examination is necessary for differential diagnosis.

WILLIAM BICKERS.

Anatomy

Zambonini, Annibale: Abnormalities of the Umbilical Cord, Rivista Italiana di Ginecologia 28: 60-75, 1945.

In a series of 10,295 placentas which were studied at the Medical College of Bologna by Zambonini in regard to abnormalities of the umbilical cord, phenomena of the cord of varied categories were found. A wide variation in the length of the cord was noted. The length of the cord averaged 50 cm., the shortest cord measuring 20 cm., twelve cords being longer than 100 cm., the largest reaching the extreme length of 170 centimeters.

None of the very rare phenomena such as hematomas, real tumors, true or false cysts were found in this survey. Twisting of the funis was frequently present, in no case, however, the coiling being such as to endanger the fetal life. True and false knots also frequently occurred, but again neither of them involved serious conditions.

Velamentous insertion of the funis was present in 48 cases (0.46 per cent), and eventuated two cases of fetal death in prematurely born twins.

Absolute shortness of the cord (less than 30 cm.) was present in 45 cases (0.43 per cent), and of these, 36 did not exert deleterious influence on the course of delivery; death occurred, however, in two cases in which the cord measured 20 cm. and 25 cm., respectively, a length not compatible with normal delivery.

Excessively long cords were largely represented; no deleterious consequences, however, were noted, except in cases in which the abnormal length was associated with loops, the cord being wrapped around portions of the fetus.

Loops were present in 1,185 of the cases, in 1,166 cases the child's neck being encircled, in 19 cases the loop of the cord wrapped around different portions of the fetal body. In eleven cases, fetal death occurred, which corresponds to a mortality rate of less than 1 per cent. Presentation of the cord occurred in only seven cases with no complications.

Prolapse of the funis occurred in 43 cases, and resulted in death of the fetus in 19 cases: i.e., in 44 per cent of the cases, which is not too high a percentage for this serious complication.

True knots were found in 57 cases, in six cases of which they were fatal to the fetus. The deleterious influence of the abnormalities of the cord in this quite comprehensive series is lower than usually quoted.

GEMMA BARZILAI.

Abortions

Russell, P. B., Jr.: Abortions Treated Conservatively, South. M. J. 4: 314, 1947.

A plan is made for the conservative management of abortions. Conservative treatment failed only thirty-five times in a total of 2,406 cases of incomplete abortions. A comparison is made between the uterus recently aborted and the uterus following full-term delivery. The placenta during the early months of pregnancy is less firmly adherent to the uterus and, therefore, more readily expelled once the cervix is dilated. Dilatation and curettage with packing was done in only 5.2 per cent of patients with abortions, spontaneous and criminally induced and at various stages of gestation. Uncontrolled hemorrhage was the chief indication for surgical interference. Conservative treatment consisted of the usual supportive treatment and 1 c.c. doses of pituitrin as required for bleeding. In those cases where operation was performed, only the sponge stick was used. Control of infection was the greatest problem, but during recent years penicillin and streptomycin have strengthened the therapeutic hand.

WILLIAM BICKERS.

Correspondence

Some Comments on Hysterosalpingography

To the Editor:

In the June, 1947, issue of the JOURNAL, Dr. Paul Titus wrote on "Oil Embolism From Hysterosalpingography." He emphasized three distinct points and these are repeated below.

First, Dr. Titus said that "altogether too many hysterosalpingographies are being performed." He restricts the use of hysterosalpingography to only those cases where the desired information cannot be obtained by the Rubin test.

Second, he maintained that "iodized oil should not be used as the opaque medium because it is a foreign body remaining as such wherever it is injected. It is not absorbed and eliminated, but remains encysted within the pelvis when passed through the tubes, or becomes a highly dangerous embolic agent if accidentally injected into a vein." Titus advocates the use of an aqueous Skiodan-acacia mixture whenever hysterosalpingography is to be resorted to.

Finally, he stresses the importance of proper technique in hysterosalpingography in order to preclude hazards from this procedure.

Dr. Titus' remarks have evoked the following comment. With his first two points I take qualified exception, and with his third point I am in wholehearted accord.

Contrary to Dr. Titus' opinion, I have found that far too few hysterosalpingographies are being performed today, even though they are indicated. True, too many are being improperly and carelessly performed, but certainly a technique should not be condemned when the fault lies with the operator. One would not junk the automobile because there are far too many drivers who handle cars recklessly. It should be our purpose, rather, to insist that definite precautionary and safety measures be employed. As a matter of fact, the judicious use of hysterosalpingography in the hands of trained technicians is rapidly becoming one of the most important implements in the diagnosis and treatment of female sterility. Illustrative of this point, Rutherford¹ has recently shown the value of repeated iodized oil instillations in women who were unable to become pregnant.

I also am not unaware that some iodized oil preparations (notably those used abroad from where most of the embolic phenomena have appeared in the literature) may act as foreign bodies and may be slowly, if ever, absorbed. However, there is an iodized oil available* manufactured and sold by an American concern, which is absorbable when used in physiologic amounts. From my experience it is obvious that the peritoneum can absorb the small amount of intra-abdominal iodized oil required for use in hysterosalpingography. In 87 successful pregnancies following the iodized oil technique, follow-up x-rays were obtained at about the fifth month of gestation or as soon as fetal parts were discernible. Owing to the fact that not more than 4 to 5 c.c. of iodized oil had been used for each hysterosalpingography, no evidence of the opaque substance could be found in the peritoneal cavities of 82 of the patients. In four of the cases, the opaque substance was barely visible; while in only one patient was definite evidence of unabsorbed oil found. No symptoms were referable to the oil and the pregnancies progressed without mishap.

It would seem, from the recent scientific exhibit of Brown, Bradbury, and Jennings² held at the A. M. A. Centennial in Atlantic City, that Dr. Titus' beliefs concerning the absorption of iodized oil were confirmed. However, when Dr. Irving F. Stein of Chicago and I discussed the x-ray plates with Dr. Jennings at the booth, she readily admitted that greater quantities of iodized oil had been instilled intraperitoneally than were necessary for actual testing. The point I stress is, that where 4 to 5 c.c. of iodized oil are used rather than 9 to 10 c.c. there exists little or no problem of oil absorption.

*G. D. Searle and Co. of Chicago manufactures Iodochlorol, a satisfactory iodized and chlorinated peanut oil combination.

Dr. Titus also pointed out that every once in a while a patient is encountered sensitive to iodized oil, and will react to it. Certainly, those who have used Skiodan extensively realize that this preparation is also not without its allergic and untoward reactions.

Finally, I am in complete agreement with Dr. Titus in stressing the importance of proper technique in hysterosalpingography. Any physician who blindly disregards precautionary measures and haphazardly shoots 10 c.c. of a foreign substance into anybody's peritoneal cavity should be called to task. Far too many tests are being performed with a 10 c.c. syringe filled with a foreign substance, the syringe emptied into the uterus without regard to manometric pressure or force. Far too many are being performed too close to the time of the menstrual period. Far too many are being performed too soon after a curettage or endometrial biopsy. Far too many are using cannula tips that are crushing and damaging to the tissues of the cervix and uterus.

There is no excuse today for the physician who does not employ every available safeguard in the performance of hysterosalpingography. It was with this in mind that Beclere³ and Jarcho,⁴ twenty or more years ago, each perfected a manometric instrument and suggested a fluoroscopic technique in the performance of uterotubal x-rays. It was what I had in mind when I took the best features of Beclere's Hysterometer and Jarcho's Pressometer and then conceived the Gynograph⁵ which allowed me to perform 1,400 consecutive hysterosalpingographies with iodized oil without a single instance of venous intravasation or embolism.

If the physician performing hysterosalpingography will but make use of every precautionary measure in this intra-abdominal technique, cases of pulmonary embolism like the one reported by Ingersoll and Robbins,⁶ in which these authors acknowledged that their procedure was "ill-advised," can be eliminated.

Again I reiterate, let us not condemn a procedure, which like exposure to gamma rays can do much good, but which when used wrongly can wreak havoc with human life.

ABNER I. WEISMAN, M.D.

1160 FIFTH AVENUE
NEW YORK, N. Y.
July 12, 1947.

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Reply by Dr. Titus

To the Editor:

Notwithstanding Dr. Weisman's comments, I have no changes to make in my original statement. This was, in effect, that uterotubal insufflation with gas or air (Rubin test) is safe as well as diagnostically sufficient in the majority of cases; that injection of certain radiopaque substances for hysterosalpingography is relatively dangerous, with reported fatalities; that this should not be made an unnecessary substitute for uterotubal insufflation, as many, including Dr. Weisman, seem to suggest; and that when such injections are made, upon proper indications, proper technique should be used to avoid accidents.

PAUL TITUS, M.D.

PITTSBURGH, PA.
August 15, 1947

Item

American Board of Obstetrics and Gynecology, Inc.

Examinations

The next written examination (Part I) for all candidates will be held in various cities of the United States and Canada on Friday, Feb. 6, 1948, at 2:00 p.m. Candidates who successfully complete the Part I examination proceed automatically to the Part II examination held later in the year.

A number of changes in Board regulations and requirements were put into effect at the last annual meeting of the Board held in Pittsburgh, Pa., from June 1 to June 7, 1947. Among these is the new ruling that the Board does not subscribe to any hospital or medical school rule that certification is to be required for medical appointments in ranks lower than Chief or Senior Staff of hospitals, or Associate Professorship in Schools of Medicine, for the obvious reason that such appointments constitute desirable specialist training. At this meeting the Board also ruled that credit for graduate courses in the basic sciences which involve laboratory and didactic teaching rather than clinical experience or opportunities will be given credit for the time spent up to a maximum period of not more than six months, regardless of the duration of the course.

Applications are now being received for the 1948 examinations. Closing date for these applications will be Nov. 1, 1947.

For further information and application blanks address Paul Titus, M.D., Secretary, 1015 Highland Building, Pittsburgh 6, Pa.

PAUL TITUS, M.D.